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Microfinance and Risk Sharing Arrangements: Complements or Substitutes? Theory and Evidence from Ethiopia

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Abstract

In rural areas of developing countries, the supply of credit mainly consists of formal microcredit providers, such as microfinance institutions, and informal credit providers, such as informal cooperatives, money lenders, relatives and friends.

Does the provision of formal microcredit services increase access to credit of rural clients and efficiency of the local credit markets? This study tries to answer this question through the development and analysis of a theoretical model and the empirical analysis of data from an Ethiopian village. This study starts from three simple hypotheses about the local informal credit market, i.e., the supply and demand of informal credit in a particular rural area. First, since the main objective of the rural poor is to smooth income from one period to another, the rural informal financial arrangements are all formed to share risk among households. Second, since they are informal, these arrangements are characterized by a limited commitment of members. Third, while the Microfinance Intermediary (MFI) charges interest on loans provided, transactions in the informal market are interest-free because the informal arrangements are not for profit but for sharing risk. Besides, the management and transaction costs are shared by all the members.

The theoretical model suggests that when some members of the informal arrangement get a formal loan all members benefit from it. The agents who have a current deficit have greater financial resources whereas the other agents who have an expected future deficit enjoy looser participation constraints. In a similar way, when the interest rate charged on formal loans decreases, the utility of not only borrowing members but all members in the arrangement increases. Besides, the formal market crowds out the informal market to some extent, that is, the total amount of transfers exchanged in the arrangement decreases as long as the loan size increases or the interest rate decreases.

Evidence from the rural village in southern Ethiopia only weakly confirms the theoretical results because of two reasons. First, the formal microcredit services and the informal risk sharing arrangements appear to be complements in the local market. This dichotomy seems to be due to the supply of different products in terms of size and term.

Second, the applied study shows that the lending approach of the MFI can be a decisive factor in explaining the possible efficiency improvements and benefits. In the Ethiopian case, the group lending approach seems to replicate the same selection and monitoring processes of the informal arrangements. For this reason, despite the presence of formal microcredit services, the low-income households remain markedly constrained in their access to credit. In conclusion, the formal credit services do not seem to outperform in terms of outreach the informal risk sharing arrangements.

Finally, MFIs that want to operate in rural area with the group lending approach should make an analysis of the self selection process and in

particular of the norms and social dynamics that take place in the selection of the group members. MFIs can increase outreach by offering both individual and group loans as well as insurance and saving products. Besides, informal intermediaries are more flexible and can provide services with lower transaction costs. Establishing more stable links with the informal intermediaries can allow the MFIs to provide more appropriate products.

Keywords: microfinance, risk sharing arrangements, limited commitment, Ethiopia, Multilogit.

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TO MY BELOVED FAMILY

AND THE ETHIOPIAN FAMILIES WHOM I MET

Microfinance and Informal Risk Sharing Arrangements in Low Income Countries

1. Introduction

In many developing countries, microfinance intermediaries (MFIs) have become important actors in the provision of formal financial services to the rural population. MFIs operate along with many informal financial intermediaries. Although informal intermediaries usually provide a wide range of financial products, such as contingent loans, insurance and savings (Adams and Fichett, 1992), most MFIs are microcredit intermediaries (MCIs) that provide only credit products.

The principal objective of the study is to analyze, in the absence of informational asymmetries, how the terms of the formal contract can generate crowding out effects and to what extent such effects increase the wealth of all the participants in the informal arrangements.

The informal arrangements are assumed to be "limited commitment" risk sharing arrangements. The reason for this assumption is that informal risk sharing contracts are common to many informal financial institutions, such as informal savings and credit cooperatives (ISACCOs), rotating savings and credit associations (ROSCAs), informal insurance parties and financial arrangements among friends, neighbors and family members. Whereas the "limited commitment" framework entails only wealth effects, informal arrangements also include social aspects that, however, are only briefly discussed here.

The paper is organized as follows: Section 2 defines microfinance and discusses its origins and recent evolution; Section 3 discusses the link between access to credit and development, starting with the introduction of risks and risk management strategies in rural areas; Section 4 presents credit risk management innovations available to MFIs; Section 5 reviews the literature on informal risk sharing arrangements; Section 6 introduces a framework for analyzing the interaction between informal risk sharing arrangements and formal lending; Section 7 presents a complex model, then offers a simplified model whose solution is discussed; Section 8 provides concluding comments.

2. Microfinance: origins, definition and main characteristics

"Microfinance" refers to local, governmental and international initiatives that promote financial services to a marginal population that is usually excluded from access to formal financial channels because of small business size, unsteady income generating patterns, or information deficiencies (Viganò, 2004). "Microcredit" refers to the provision of credit to excluded populations using specific lending approaches. Whereas microcredit entails the only provision of small loans, microfinance consists of a broader range of financial services that can include microcredit.

Most of the scholarly literature and a large part of the microfinance (MF) community wrongly date the birth of the microfinance movement to the founding of the Grameen Bank in the 1970's (Seibel, 2003). The founding of the Grameen Bank, however, was preceded by the emergence of small farmer cooperatives in Europe in the nineteenth century. The most

successful examples are the German cooperative movements --started in 1840s-- led by Herman Sculze-Delitzsch in urban areas and Friedrich Wilhelm Raiffeisen in rural areas (Moody and Fite, 1984; MacPherson, 1999). About a decade after, this movement began to spread across Europe. The cooperatives were based on "bonds of association" similar to the solidarity lending principles employed by many of today's operating microfinance institutions and intermediaries.

Prior to the establishment of the European credit cooperative movement, the "Monti di Pietà" (literally Mountains of Pity) communal pawnshops, mainly promoted by Catholic congregations, sprang up in Europe in the middle of the fifteenth century. These institutions were founded as response to rampant poverty and, hence, the increasing demand for contingent loans, most of which were provided by so-called "loan sharks," so named because they demanded usurious interest rates[1]. The first successful Mountains of Pity movement was founded in Perugia (Italy) in 1462 A.D., which postdated earlier unsuccessful attempts in Germany, Switzerland and the United Kingdom (Degani, 1916). Mountains of Pity required clients to pledge valuable goods that would be returned as the debt was repaid. The loan was proportional to the pawn's value and an administrative fee was charged (Degani, 1916)[2].

Credit and saving cooperative movements also emerged in low-income countries one or two decades before the establishment of the Grameen

[1] The application of interest rates was prohibited by the Catholic Church according to the interpretation of the Luke's gospel.

[2] Starting in 1512, the Catholic Church formally allowed the application of small interest rates for covering administrative costs (Degani, 1916). Before such proclamation, with regards to the congregation's policy, each Mountain of Pity individually decided whether to charge any fees.

Bank in the 1983[3]. For example, Lee, Kim and Adams (1979) document that in 1975, some cooperatives in Korea provided a wide range of services, including credit and savings deposit services, to about two million member farmers. Similarly, Von Pischke (1983) reports that in the 1970s, Kenyan cooperatives with successful credit schemes, introduced also saving schemes, allowing them to expand their lending capability.

Over the years, microfinance has become widely used as a development strategy. According to Daley-Harris (2009)[4], around 3,552 microcredit institutions were operating at the end of 2007, serving about 154 million clients. Gonzalez (2008) proposes more conservative figures. Gonzalez's analysis relies on mixed data obtained from three different sources: the Microfinance Information Exchange (MIX), the Microcredit Summit Campaign (MCS) and the Inter-American Development Bank (IADB). According to Gonzalez (2008), in 2007 there existed 2,420 microfinance institutions that provided financial services to more than 99 million clients. The microfinance market in South Asia makes up more than 50% of the current world clientele. Moreover, South Asia together with Latin America and the Caribbean represent 54% of the operating microfinance institutions and about 67% of clients. Africa, in particular Sub-Saharan Africa, markedly lags in outreach even though it has a comparable number of operating institutions, providing financial services to only 12% of world borrowers.

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[3] However, an action research project started in 1976 but only in 1983 the project was transformed in an independent bank: "The origin of Grameen Bank can be traced back to 1976 when …[it was]… launched an action research project to examine the possibility of designing a credit delivery system to provide banking services targeted at the rural poor.", http://www.grameen-info.org/index.php?option=com_content&task=view&id=19&Itemid=114 .

[4] Daley-Harris was one of the promoters of the Microcredit Summit in 1997. The Microcredit Summit campaign has always been characterized by optimism about development and growth of microfinance.

Microfinance has gained substantial support among donors, practitioners and NGOs because it has been proven to be a credible alternative to unsuccessful government and rural credit schemes introduced in developing countries in the 1960s and 1970s (Von Pischke, Adams and Donald, 1983; Mosley, 1996). These government credit schemes suffered from planning and managerial inefficiency and corruption (Von Pischke, 1980). The rural credit policies were implemented as supply-leading finance instruments with the purpose of providing cheap credit to poor farmers. As arrears started to increase, lendable funds shrunk and a bad credit discipline became prevalent. This, finally, led to a shift in the clientele served, from many poor farmers to few large and low-risk farmers.

Microcredit and microfinance are based on the assumption that the poor can carry out income-generating investment activities (Hulme and Arun, 2009), but do not have access to the necessary financial services (savings deposits, loans, insurance products and, as an effect, payment services).
Microcredit institutions (MCIs) are usually set up by government or international actors and lend from a revolving fund made up of external contributions[5]. Therefore, MCIs can cover losses only by depending on state or international sources. This financial dependency promotes meddling by the external actors in the management of the institution. Moreover, in the medium run, MCIs may struggle to expand unless they scale up local resources mobilization and, in particular, the collection of

[5] It is worth noting that when the institution is no longer able to recover bad loans and, hence, must write them off, the unpaid loans resemble social transfers. It follows from this that a fund is "revolving" as long as loans are repaid; otherwise, more properly, it resembles a donation fund but with side-effects on, for instance, credit culture (Masini, 1989).

savings. In this latter case, the institution would fall under the more general definition of a Microfinance institution (MFI).

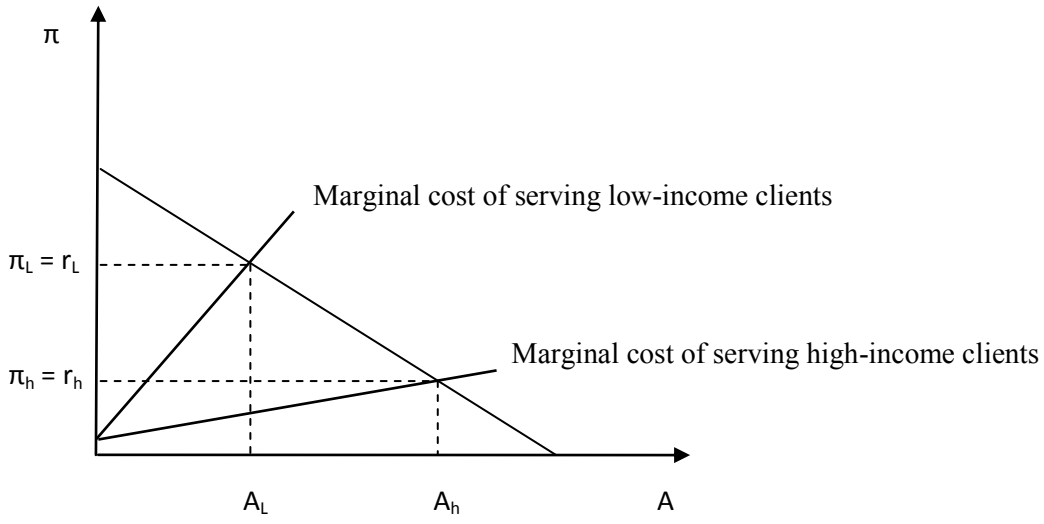
Notwithstanding this differentiation, in this article, microcredit is intended to represent a specific financial service that can be provided by both microcredit institutions and microfinance institutions (MFIs), but, as discussed below, when the delivery methodology is considered, it cannot be fully detached from financing sources.

Although the definition of microfinance is not only related to the income level of customers, low earnings and small economic size of potential customers are among the main obstacles to access to financial services. However, there is a microeconomic explanation why lending to small economic units can be profitable: high returns to scale (Gonzalez-Vega, 1984). If returns to scale are decreasing, asset-poor people are more productive on the margin than asset-rich people (Figure 1). This simple intuition suggests that financial institutions should be more willing to provide credit to small enterprises than to bigger enterprises because they can demand higher interest rates.

However, providing credit to poor clients operating in the informal sector might be more costly. First, catering small loans entails high transactions costs. When a loan is originated, the intermediary incurs in a fixed cost (assessment of repayment ability, labor cost, opportunity cost) regardless of the loan amount. Second, there are higher costs associated with assessing and monitoring poor clients, especially if they reside in rural areas. In this case, informational asymmetry is produced by the geographical distance between the lender and the borrower, as well as cultural or linguistic differences. Third, poor clients usually lack the

necessary asset-based collateral often required by formal lending intermediaries. In formal lending, in order to partially overcome incentives problems, borrowers are often required to pledge the ownership of some valuable assets. In rural areas of developing countries, title deeds might be lacking or hard to verify. Also, pawnable assets might be of low market value or barely cashable.

Figure 1 – Level of productive assets (A) and productivity (π)



Source: Gonzalez-Vega (1984).

From these three preliminary remarks, it follows that serving low-income clients in rural areas is intrinsically more costly than the rest of the clientele. However, if asymmetric information problems and transaction costs could be sufficiently reduced, the low income sector has the potential to be profitable for MFIs. In presence of high returns to scale, MFIs can charge higher interest rates to cover the additional costs.

In this regard, Gonzalez-Vega (1984) suggests that interest rate restrictions can make the provision of financial services to the poor unprofitable. More importantly, interest rate caps prove costly also for the client. For the rural poor, the client's transaction costs can be higher than the direct costs of borrowing, i.e. interest rate and fees, contrary to what is expected. A lower interest rate corresponds to a smaller loan amount on which to split the high transaction costs. The relationship between interest rate restrictions and the expansion of financial services to the poor is called the "Iron Law of Interest Rate Restrictions." In 1984, Gonzalez-Vega stated "When interest-rate ceilings become more restrictive, the size of loans granted to the non-rationed borrower classes increases, while the size of the loans granted to the rationed borrower classes diminishes" (Gonzalez-Vega, 1984, p. 86). Rationing occurs through noninterest terms and loan size. The issue of interest rates is a still a lively discussion among donors and governments. Aid agencies, for example, frequently impose restrictions on interest rates charged in microfinance projects. This issue is related to another current discussion, which is transparency in financial products pricing.

Microcredit services, but also microfinance services, can be classified according to three criteria: the approach employed, the banking technology and the formality of the institution.
The range of possible approaches that an MFI can choose from has expanded over the last two decades.

The two classical approaches are individual and group lending. Group lending is acclaimed by researchers and practitioners. In group lending, a group of borrowers is established by a formal contract and all members

are jointly and severally liable for the repayment of each member[6]. Here, peer pressure, stemming from social norms, and loan-renewal incentives operate.

In contrast, in individual lending, the emphasis is put on the repayment ability of the borrower, most notably on physical collateral. In addition to these two approaches, several lending and financial approaches to distribution have been developed. Some outstanding examples are: 1) Village banking in which the entire village is responsible for the distribution, collection and repayment; Bank Rakyat Indonesia (BRI), for instance, established a village bank system in 1984. 2) Mobile banking, in which mobile agents provide door-to-door financial services. 3) Telephone banking, examples of which can be found in Brazil, Indonesia, the Philippines (Smartmoney and GCash), South Africa and Kenya (M-Pesa) (Mas and Kumar, 2008). 3) Branchless banking (Mas, 2008; Pagura, 2008). 4) Self-help group (SHG) lending, such as the national SHG programme in India[7]. 5) Lending through pre-existing local cooperatives. Some of these techniques stand out for being able to tap locally rooted facilities or longstanding institutions. In telephone banking, for instance, access to financial services is enhanced by the provision of these services along a more widespread and *pre*-established network, that is, the telephone network (Mas and Kumar, 2008). A similar strategy is applied in the branchless lending (Pagura, 2008). Other techniques such as the cooperative lending technique or the SHGs' lending technique exploit and promote local indigenous institutions and initiatives[8]. Each technique aims

[6] The contract can be also semi-formal or informal if the institution providing group loans is semi-formal or informal respectively.
[7] For a more detailed discussion: Monsley and Arun (2003).
[8] In some countries, credit and saving cooperatives (SACCOs) have been promoted by external actors (Von Pischke, Adams and Donald, 1983).

to reduce a specific transaction cost either on the side of the MFI, that is, in supply of financial services, or on the side of the client, that is, in demand of financial services.

Another way to classify microfinance institutions is on their "formality". Formality refers to the extent to which the financial activity of the MFI is regulated by the government. Formal financial institutions, whether private or public, are subject to government banking regulations and supervision. Private institutions usually operate in urban areas, provide a wider range of financial services (in particular, deposits) and mobilize greater deposits from the general public (Ledgerwood, 1999). Public institutions, prior to the reforming processes that were carried out in many developing countries, operated mainly in rural areas and aimed at implementing specific development policies, including the imposition of concessionary interest rates on loans to agricultural operators or the implementation of subsidized public agricultural credit programmes (Viganò, 1996). Over the years, many agricultural development banks have been reformed or privatized, but in many cases the political will is still missing. Governments have been looking for other ways to allocate subsidies, such as cooperatives, provincial banks, and village or community funds (Nagarajan and Meyer, 2005).

Another category of MFIs that are not controlled by banking authorities include MFIs that are licensed and regulated by other government agencies (Ledgerwood, 1999). These "semiformal" institutions can include, among others, credit unions, savings and credit cooperatives (SACCOs) and some NGOs (Ledgerwood, 1999). However, the bounds of this category are not well defined. In most countries, telephone and branchless banking fall within this definition as long as they are chartered by the

government but not supervised by the financial authorities (Mas and Kumar, 2008)[9].

In some countries, MFIs, either private or public, and SACCOs are regulated and supervised by the central banks, but their level of formality varies from country to country.

The last category of MFI is the informal financial institutions, which operate outside both government and banking regulation. Given their small size and high informality they are difficult to supervise. According to Adams and Fichett (1992), informal institutions are especially able to overcome cost and information barriers that restrain formal finance from expanding into the microfinance field. Informal finance is composed of, among others, moneylenders, merchants, pawnbrokers, loan brokers, landlords, friends and relatives, money guards, savings groups and Rotating Saving and Credit Associations (ROSCAs)[10]. Informal institutions are not characterized by economies of scale, but rather are differentiated from their formal counterparts by the relatively small number of members served. In addition, informal institutions stand out in that they possess an informational advantage: members usually have daily contacts and frequent social and economic interactions, within the smaller service area, that support the reciprocal exchange of information. Moreover, the price of financial services provided is not fully explicit. For instance, merchants that provide trade credit hoard information through purchases and sales and may recover the costs associated with the payment extensions by

[9] These examples point out the typical issue whereby financial regulation lags behind financial innovation.

[10] For a deep and comprehensive analysis of the informal finance sector see: Adams D. W and D.A. Fichett (Ed.s), 1992, *Informal Finance in Low-Income Countries*, Boulder: Westview Press, Inc.

adjusting the price of the commodity involved. As another example, loans to friends and relatives might be interest-free, but provide lenders with credit reserves that they can draw upon whenever they are in need in the future (Adams and Fichett, 1992).

3. Risk in rural finance and the role of microfinance

Rural areas are settings characterised by different sources of risk. In addition, the major source of income is agriculture, and this feature only aggravates the volatility of earnings.

Agriculture is, in fact, an intrinsically risky economic activity with an excess of uncertainties (Anderson, 2003). It follows that the main decision to be taken by farmers is which risks to bear and to what extent (Anderson et al., 1977). In a risky environment, the decisions are determined by the risk environment and by the beliefs and preferences of the decision maker (Hardaker et al., 1997). However, regardless of the risk aversion of the farmer, if all the necessary risk management strategies were available and the financial markets were efficient, risks would play almost no role in the allocation of resources. This is, unfortunately, not the case in many agricultural systems, especially in developing countries.

Notwithstanding the importance of risk, information is the primary factor that drives decision making of farmers. Bad information that biases crop yield expectations can lead farmers to make suboptimal decisions. At the same time, imperfect information disperses the subjective distribution of expected outcomes and, hence, exacerbates perceived risks. As Anderson (2003) notes: "[…]a farmer who has no knowledge of a new technology

may be thought of as having a prior distribution for the returns from that technology with wide dispersion" (Anderson, 2003, p.164) and the dispersion of the subjective distribution reduces every time that such technology is employed and the returns are realized[11]. Anderson (2003), however, argues that the mean of the distribution might be of a greater importance in the decision process of adoption of a new technology.

Moreover, agricultural activities are spatially localized and, in contrast to other economic activities, cannot be diversified on-farm. To reduce this risk factor, agricultural activities as well as rural financial markets need to be diversified over space. However, if the local rural economic system is small, agricultural risks and, in particular, systemic risks cannot be avoided through diversification over space. Besides, even rural non-agricultural activities that use resources generated by the agricultural system can be affected by agricultural risks.

All the issues discussed above are accentuated in poor rural areas of developing countries. Uncertainty regarding rainfall, commodity prices, and livestock disease outbreaks are examples of factors influencing farm household income.

When poor people face uncertainty, as in many developing countries, the exposure to hazards becomes more severe. Poor farmers are less resilient to adverse idiosyncratic and external shocks and, therefore, risk contributes to the probability of remaining poor in the future.

[11] Learning by doing

Risk aversion contributes to poverty in two main ways. On the one hand, when exposed to risk, poor farmers adopt production strategies and technologies that are risk-reducing, but not necessarily profit maximizing (Dercon, 2005). There are farming technologies that generate more stable, but lower returns, such as drought resilient crops or efficient irrigation systems. These technologies, however, are often prohibitively expensive for poor farmers, forcing them to chose more-stable but lower income generating strategies. Similar considerations apply to the diversification strategies of poor small landholders. Given that returns from different agricultural activities are positively correlated, spatial separation of plots is a strategy that generates some benefits in spreading risk (Nugent and Sanchez, 1998; Pandey et al., 2001), but can be inefficient if economies of scale are not present[12]. Therefore, available strategies to poor farmers, even if they reduce the volatility of consumption, in the medium term hinder the accumulation of capital necessary for high-return investments.

On the other hand, when an uncertain negative shock occurs, it might directly affect production capacity by damaging assets and temporally impeding access to inputs and output markets. In a multi-market equilibrium framework, as described by Carter and Barret (2006), assets play an important role in determining the dynamics of the accumulation of wealth and the long-run equilibrium. A shock that reduces the level of assets under a certain threshold can reduce capital stock and thus keep the household in the poverty state.

[12] Even though the diversification of plots can lead to a reduced exposure to systemic risk and lead to a lower variance of returns, it can also imply greater time and transportation costs and smaller economies of scale.

The wealth of poor rural households is determined by their livelihood. As for Ellis (1998), livelihood "...encompasses income, both cash and in-kind, as well as the social institutions (kin, family, compound, village and so on), gender relations, property rights..." as well as "...access to, and benefits derived from, social and public services..." (Ellis, 1998; p. 4).

In presence of incomplete and inefficient financial markets, poor households must bear substantial risk and undertake informal livelihood strategies involving production, employment, and location decisions to cope with environmental, economic, social and political hazards (Morduch, 1995). However, these "second-best" risk-coping strategies can entail high costs in terms of forgone income and consumption in the short, medium and long run.

Strategies to cope with risks can be either *ex-ante* or *ex-post*. *Ex-ante* risk-coping strategies are designed to reduce the risk associated with income generating activities by building up monetary reserves and social-economic buffers. These strategies include the adoption of low yield and low risk technologies, the diversification of income sources (Alderman and Paxson, 1994; Morduch, 1995), the accumulation of individual (self-insurance) or collective savings, in cash or in-kind, investment in social and risk sharing networks, migration (potential remittances) and the establishment of patron-client arrangements (Zeller et al., 1997). A risk strategy might also entail diversification among farm, off-farm and non-farm sources of income as well as diversification among income activities such as agricultural processing, handicraft production or wage employment. Ellis (1998) argues that causes and sources of diversification differ according to location, assets, income, opportunities and social relations. *Ex-ante* strategies can also entail the establishment of more stable

business arrangements with other farmers, such as sharecropping contracts (Sharma and Dréze, 1996), sharing of factors of production and local cooperatives. *Ex-ante* strategies also include ROSCAs and informal insurance parties.

Ex-post risk-coping strategies, on the other hand, are designed to directly mitigate the effects of adverse events as they occur and to smooth consumption when *ex-ante* strategies are insufficient. *Ex-post* strategies include the selling of assets, consumption substitution (Fafchamps *et al.*, 1998; Keil *et al.*, 2008), and emergency borrowing and other contingent transfers from informal actors.

As long as financial services allow households to improve their cash management, thus avoiding liquidity costs, and to partially transfer investment risk, access to credit can effectively improve the wealth of poor people. For instance, holding credit reserves to resort to in bad years is a widespread and successful business strategy. However, as suggested by Anderson (2003), farmer financial decisions are dualistic.

If financial markets are complete, the different households' preferences in terms of risk and return can be satisfied. For example, with regards to savings products, households that are more risk-adverse can choose products that can be liquidated at a lower cost and whose value is more steady over time.

Besides, financial products can be more effective than physical assets in dealing with systemic shocks. In the aftermath of a systemic shock, as the demand for money increases, the excess supply of physical assets also increases whereas the price goes down. Households are forced to sell off

their assets at a price lower than the pre-shock price. On the other hand, financial products can be already liquid or can be liquidated by paying a penalty, as in the case of savings or time deposits, according to the risk preferences of the client. However, bank run risk and possible transaction costs have to be taken into account.

Access to financial services influences income smoothing decisions. If households have access to formal contingent sources for smoothing consumption in case of adverse events, they can make more daring and profit-maximizing production and employment decisions, without sacrificing profits for lower risk. At the same time, with access to credit, households can afford more resilient and productive assets and, hence, reduce the effects of a hazard[13]. However, this latter consideration assumes that poor households have access to improved technology and commodities markets. Similarly to credit, insurance products and competitive deposits products can reduce the exposure to adverse events and allow the accumulation of precautionary and investment capital, respectively.

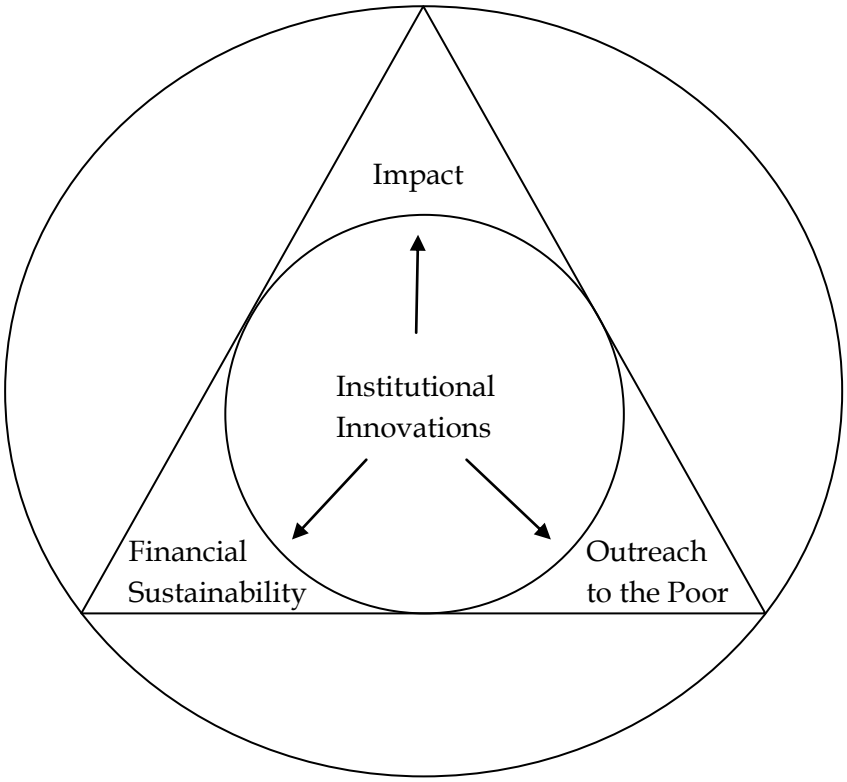
Microfinance can thus play an important role in mobilizing local resources, spurring the accumulation of capital, and reducing exposure to both systemic and idiosyncratic risks. In the medium run, if access to financial services positively influences consumption decisions, insurance and credit may also play a role in improving health and education conditions (Morduch, 1995). This is observed in practice if microfinance becomes as effective and sustainable as informal finance (Adams and Fichett, 1992). Microfinance, and formal finance in general, has to

[13] If access to financial services leads to moral hazard problems, the net social benefits might lower than in absence of a financial market.

overcome high transaction costs, informational asymmetries and demand for exotic forms of collateral—issues that informal financial markets have relatively successfully addressed.

Both effectiveness and sustainability can be realized only through process innovations that reduce costs and risk in the delivering of financial services and, at the same time, enable the development of products better tailored to the real necessities of the poor (Zeller and Meyer, 2002).

Figure 2 – The triangle of microfinance



Source: Zeller and Meyer (2002; p. 6)

Finally, innovations enable MFIs to pursue at the same time three ultimate objectives: 1) generate impact; 2) achieve financial sustainability; and 3) increase outreach to the poor (see Figure 2; Zeller and Meyer, 2002). The latter objective regards the ability of MFIs to serve poor clients and, in particular, to design financial products that are attractive for poor people and can reduce both lender and borrower transaction costs. Lower transactions costs of financial services can also increase outreach. Impact refers to side-effects on poverty generated by access to financial services. Impact is generated as long as financial services enable clients to accumulate productive assets and smooth consumption over time.

Product innovations can reconcile the pursuit of these three seemingly different objectives, i.e. generate impact and increase outreach, along with achieving financial sustainability. In fact, whenever innovations reduce direct and indirect costs and attract more poor clients, thus generating economies of scale, the three objectives can be pursued at the same time (Zeller and Meyer, 2002).

In rural finance, many improvements have been made in dealing with information problems and contract enforcement limitations (Nagarajan and Meyer, 2005). Some of the advances in approaches have been discussed above, such as mobile banking, SACCOs lending and SHG lending. Some product innovations regard deposits, rural housing loans, leasing products, products dedicated to remittances, insurance products and products that comply with Islamic laws. Advances in process include financing through value chains, partnerships between commercial banks and informal institutions, strategic alliances among different kinds of institutions and, finally, the use of information technology (Nagarajan and Meyer, 2006). However, most of these innovations have not been able to

make financial services available to the remotest areas and to the poorest of the poor (Nagarajan and Meyer, 2006). New advances are needed to address these challenges such as innovations that provide technical assistance and financing to informal institutions in remote areas and more efficient tools for managing risks in rural areas (Nagarajan and Meyer, 2006).

4. Risk management innovations in rural finance

Providing micro-financial services to rural households in developing countries is intrinsically challenging. Transaction costs, information asymmetries and risks are the main obstacles to expanding finance into rural areas. While most of the effort has been dedicated to overcoming the first two problems via financial market reforms and new approaches (such as group lending, telephone banking or village banking), efficient risk management by microfinance institutions remains largely unsolved (Wenner *et al.*, 2007). Credit and interest risk seem to be the principal problems that hamper the expansion of microfinance intermediation into rural areas.

The discussion here focuses on credit risk as it is believed in this article as the most challenging risk in rural areas.

Credit risk can separated into idiosyncratic credit risk, i.e., individual borrower's credit risk, or systemic credit risk, i.e., credit risk of the whole portfolio. The distinction, however, is not so clear-cut since shocks are complex and their occurrence and intensity can be the consequences of

different factors. Each client is exposed to both idiosyncratic and systemic shocks.

Idiosyncratic credit risk can be diversified by increasing the types and number of clients[14]. Systemic credit risk can be managed through spatial diversification. Diversification and scale strategies can substantially reduce credit risk, but can be difficult or even impossible to implement by small rural MFIs.

A systemic shock can affect small rural MFIs in three ways. First, a MFI that has a poorly diversified portfolio can be severely impaired by the widespread default of many small farmers (Yaron *et al.*, 1997). Second, affected households can ask the MFI for additional loans. MFI's reputation can be potentially damaged if the intermediary is short of liquidity and temporally unable to meet such demand for borrowing. Third, if the intermediary is deposit-taking, a potential run on the MFI's deposits can lead to a liquidity crisis (Skees and Barnett, 2006; Nagarajan, 1998).

In developed countries, larger farmers and rural financial institutions enjoy access to different risk-management services, such as reinsurance, securization, price-pooling arrangements, forward contracting, commodity futures and options markets. These services are usually unavailable to smaller economic actors and institutions in developing countries for different reasons, including small size, lack of infrastructure and limited knowledge. Claessens and Duncan (1993) argue that upper-tier institutions, such as production cooperatives and MFIs, might take advantage of such instruments.

[14] Also, effective credit scoring methodologies require a large number of clients and credit histories (Nagarajan and Meyer, 2006).

Rural MFIs, on the contrary, rely mainly on internal risk management strategies (Wenner *et al.* 2007):

- appraisals of client creditworthiness combined with performance incentives for clients and staff;
- spatial, sectoral and commodity diversification of loan portfolios;
- limiting expansion of the agricultural portfolio; and
- capital provisioning.

However, some of these strategies, such as spatial diversification or capital provisioning, can be prohibitive for new and small intermediaries (Wenner *et al.*, 2007).

Differently from rural financial institutions in developed countries, rural MFIs have often limited access to risk-transfer arrangements, particularly insurance against catastrophic weather risks (Skees et al., 2007). Some recent and promising innovations for dealing with systemic weather risk involve the development of index-based risk transfer products (Skees and Barnett, 2006). This kind of risk transfer product can be developed as options, bonds, derivatives, or insurance instruments. An index, on which the insurance product is built, is a readily measureable random variable that is highly correlated with losses, but which cannot be influenced by either the insurer or the insured. Index insurance avoids costly loss assessment of many small, geographically dispersed farms. Moreover, since the index cannot be influenced by the farmers, index insurance is generally free of moral hazard problems. Nonetheless, index-based insurance schemes entail possible basis risk, that is, the possibility that some losses incurred by the farmer are not matched by indemnities paid by the insurance company. This latter problem poses the issue of finding a reliable index and constructing an effective indemnity schedule. Major

pilot programs are focused on developing index-based insurance products (Skees and Barnett, 2006). These pilot programs, however, have yet to demonstrate that index-based insurance schemes can be universally successful, particularly in remote areas or areas where weather patterns have been changing unpredictably due to global climate changes (Nagarajan and Meyer, 2005).

MFIs and, more generally, financial intermediaries are aggregators of risks since they pool to some extent the idiosyncratic risks of their clients in the loan portfolio[15]. If a local systemic risk is markedly traceable in the MFI's portfolio, an index-based insurance product can be an effective way to transfer credit risk. If systemic credit risk constraints can be eased through index insurance, MFIs should be able to further expand their rural loan portfolios. Skees *et al.* (2007) though note that the cost of setting up an index-based insurance scheme should be compared to the opportunity costs of evaluating the personal credit risk of all clients and building financial reserves. Skees *et al.* (2007) suggest, however, that they are not mutually exclusive and "[…] The optimal strategy is likely a blend of these two mechanisms […]" (Skees *et al.*, 2007, p. 1259).

Even though systemic risk is detrimental to the expansion of rural financial services, idiosyncratic risks, such as death or illness of breadwinner, can also be very pervasive in poor rural areas, where households have inadequate access to effective safety nets and coping strategies. In addition to informal insurance mechanisms, MFIs can disburse timely loans upon the occurrence of negative shocks or favor the accumulation of savings. Promoting savings-related products can be an

[15] As much as MFIs aggregate risk depends on the size of loan portfolio and the terms of loan contracts.

optimal solution for managing idiosyncratic risks of the clients, but farmers could be too liquidity constrained to save, and the mobilization of savings may be forbidden to MFIs, as it is the case in many developing countries. An alternative or complementary strategy to savings mobilization is the establishment of microinsurance services. A microinsurance product, such as life or health microinsurance, can be provided on an independent basis or in conjunction with the granting of a loan[16]. The latter way reduces intrinsic credit risk and can reduce the cost of the loan even though the premium for the insurance product has to be added to the cost of financing. Notwithstanding these potentialities, microinsurance services suffer from well-known insurance problems, that is, contract enforcement and asymmetric information problems. The lessons learned from the failures of past agricultural insurance schemes suggest that the supply of insurance must be demand-driven and insurance products must be designed to insurance against only one peril (Mosley, 2009). The current supply of microinsurance does not seem to meet the demand from poor rural dwellers (Mosley, 2009), and this difficulty, together with adverse selection problems, has led to low take-up rates, high claim rates and low renewal rates (Ito and Kono, 2010).

In conclusion, market reforms and approach improvements have enabled MFIs to increase outreach into rural areas. However, risks remain the main obstacles to the expansion of rural financial intermediaries. Index-based insurance and microinsurance, two promising innovations for dealing with systemic and idiosyncratic risk, respectively, require a better understanding of implementation costs, opportunity cost of traditional

risk management strategies and deeper analysis of the demand for insurance products.

5. Informal risk sharing networks and limited commitment

In rural areas of developing countries, a usual strategy of households to cope with risks is "informal risk sharing". Informal risk sharing arrangements are networks of two or more members designed to help each other through reciprocal transfers[17]. For example, informal cooperatives of farmers can be regarded as informal risk sharing arrangements whereby all the members share the production risk [18].

Depending on when the informal risk sharing arrangement is formed, it can be a risk coping strategy or a risk management strategy. Risk sharing strategies entail contingent transfers and aid among or within households. This reciprocal help can be a sum of money, labor, or in-kind. The underlying structure of risk sharing arrangements is similar to a credit contract, or, to be more precise, a quasi-credit contract where the maturity of the loan and the amount repaid are uncertain. One person makes a transfer to another person or group of persons in need and this gift contributes to an imaginary reserve whose value changes over time according to economic incentives, trust and social norms. The persons who make the transfers expect to draw from such reserve in the future should they be in need; that is, the beneficiaries in the arrangement receive a gift in exchange for an expected reciprocal transfer in an undefined time

[17] Families are natural risk sharing arrangements where wealth is pooled and consumption allocated according to some rules.
[18] As an example, a pair or a group of friends can fall into this definition.

in the future. Because the contract is informal and the transfer is a gift, no formal commitment (limited commitment) nor interest rate payments are provided. This mechanism is like that of Rotating Savings and Credit Associations (ROSCAs), in which a group of persons contributes to a collective fund. Then, in turn, each member receives the fund depending on predetermined allotment rules. As long as the benefits of membership are more valuable than defaulting, the ROSCA keeps functioning (Van Bastelaer, 2000). Although ROSCAs have more structured rules than simply "expected reciprocity," they can be considered an informal risk sharing arrangements.

Coleman (2000) suggests a definition of informal risk sharing arrangements that encompasses both social and economic aspects: "When an individual asks a favor from another, thus incurring an obligation, he does so because it brings him a needed benefit; he does not consider that it does the other a benefit by adding to a drawing fund of social capital available in a time of need. If the first individual can satisfy his need through self-sufficiency, or through aid from some official source without incurring an obligation, he will do so and thus fail to add to the social capital outstanding in the community." (Coleman, 2000; p. 34). In this definition, Coleman (2000) points out some important features of informal risk sharing arrangements. One feature is the limited commitment in the underlying informal contract. Another feature is the accumulation of social capital. This includes the creation and evolution of social norms, and the amassing of trust. The final feature, with which this study is most concerned, is the interaction of these informal groups with formal institutions. Even though Coleman (2000) bases his argument for a household's decision to exclude itself from informal arrangements on the receipt of external aid, this issue can be extended to access to the services

of financial institutions as well and to the possible crowding out effects of formal financial institutions on informal risk sharing.

Many theoretical and empirical studies have used limited commitment to explain the static and dynamic structure of informal insurance arrangements in low-income countries[19] (for a brief review see: Kimball, 1988; Coate and Ravallion, 1993; Kocherlakota, 1996; Gauthier, Poitevin and Gonzalez, 1997). In the limited commitment contracts, there are no formal obligations and terms, but the provision of the financial service, when requested by the other contracting party, is based solely on economic incentives, i.e. expected benefits. In absence of formal penalties and formal enforcement institutions, the defector is punished by expulsion from the informal deal. In a rural area, for example, punishment implies that the farmer must fall back on autarky and rely solely on her own resources. The punishment can also imply the exclusion from other informal institutions with economic, social or religious purposes. Therefore, the punishment for reneging is the weighted difference between the benefits of belonging to the arrangement and those deriving from staying by herself[20]. When the participation constraint applies, the expected punishment is the feature that allows the arrangement to be self-enforcing. When farmers are very concerned about the future (i.e., expected future period utilities are sufficiently weighted compared to current utility, that is, the utility discount factor is higher than one), Kimball (1988) suggests that, in normal periods, informal "famers' cooperatives" are a less costly and more effective insurance alternative

[19] An informal risk sharing arrangement can be considered as a repeated-game model whereby, in every period, each player evaluates the current and futures utilities of staying in the arrangement compared to utilities in autarky.
[20] In Kimball's (1988) model the weight of expected utility is the inverse of the discount factor.

than scattering of fields[21]. However, only when the utility discount factor equals one (the critical level in Kimball (1988)), can full risk sharing be achieved, i.e., the risk sharing arrangement effectively eliminates all risk. Coate and Ravallion (1993), similarly, indicate that informal risk sharing arrangements are more likely to diverge from first-best risk sharing when insurance is poorly demanded. The authors propose examples where income realizations of all participants are generally low or when incomes of only very few members are low[22]. Ligon *et al*. (2002) study the dynamics of consumption and income in three Indian villages. They also employ limited commitment as an impediment to risk-pooling, but consider a dynamic model. They verify that the dynamic model is able to explain actual consumption in response to changes in income, but cannot explain the distribution of average consumption among households. They do find, however, that the dynamic model outperforms the static limited commitment model.

Even though models based on the "limited commitment" framework have proven to have some explanatory capacity, they have, however, some evident drawbacks. One remarkable weakness regards the absence of any modeling of possible emergence of social characteristics and, in particular, of social norms and trust. Social norms emerge from interaction of the members and can provide, for instance, that the defector be punished by other members of the arrangement if she fails to make a transfer to any one of the members. Trust also emerges from interaction and might be understood in the limited commitment framework as the probability that

[21] Kimball (1988) considers a CRRA (Constant Relative Risk Aversion) utility function.
[22] When all or few participants in the arrangement have low income realizations, the risk sharing arrangement is ineffective. When all have low realizations, pooled resources are so limited that it is more beneficial to consume in autarky. In the other case, when few income realizations are low, the expected benefits of the better off are too low for creating incentives to make the transfers, and the arrangement breaks down.

the other members would reciprocate in the future as inferred from past evidence. Trust can be supposed to evolve over time according to breaches and abidance to the informal contract.

That most of the studies on risk sharing arrangements are inconclusive in fully explaining their functioning, the discussion with regards to the real effectiveness of risk sharing arrangements is therefore open and would fall within a more general discussion on the relationship between social and economic networks and development.

Adams and Fitchett (1992) state that the strategy of establishing and strengthening interpersonal ties may be a significant instrument for managing uncertainty and risk, especially when financial markets are incomplete. Morduch (1999), though, is not of the same opinion. Morduch (1999) makes a review of studies that assess the ability of informal risk sharing arrangements in mitigating unexpected shocks. Most of these studies find that informal coverage changes dramatically according to the class and type of the shocks. According to these and other considerations, Morduch (1999) suggests that the informal insurance arrangements are barely effective in providing protection to poor households. First, these informal arrangements seem to provide in practice insurance against only few idiosyncratic risks and the loss coverage is often partial. Secondly, Morduch (1999) argues that these informal institutions stagnate the social fabric and hinder economic development, social mobility and migration.

This paper does not attempt to analyze the effectiveness of risk-sharing arrangements in coping with idiosyncratic or external shocks, and in contributing to social welfare, but does attempt to model the interaction between informal insurance contracts and the formal credit market in a

poor rural environment. In particular, it aims at measuring to what extent the preservation of informal risk sharing might be more or less beneficial to MFIs. Moreover, it is not concerned solely with possible crowding out effects of the MFI but also on how the MFI can create economic incentives for establishing and eventually maintaining informal arrangements. For instance, as the amount borrowed from the MFI increases the resources available to farmers to finance possible transfers to other members, access to credit might favor, to some degree, the informal insurance mechanisms. This is, in principle, interpretable with the limited commitment framework whereby, in this special case, the loan would ease the risk sharing participation constraint. On the other hand, if access to credit lessens consumption volatility over periods, risk sharing arrangements are relatively less needed.

A brief discussion on the interaction between informal and formal institutions is presented in the next section.

6. Informal networks and credit market

As explained in the first paragraph, microfinance is considered a methodology of delivering financial services, built on the extent and strength of personal horizontal networks[23]. Group lending, in particular, is regarded as a tool that harnesses comparative information advantages to develop more cost-effective financial services. According to Besley (1995), group lending is analogous to an informal risk arrangement but in the former, the joint liability is forced by the formal contract. While in the

[23] Horizontal networks are here regarded as networks of people/households that belong to the same social strata or do alike business activities.

informal risk sharing mechanism, if one member is in need the others help her out if incentives exist and social norms are sufficiently stringent, in the group liability mechanisms of microfinance, the informal risk sharing networks might be reinforced by the formality of the lending agreement.

In group lending, the group self-selection capitalizes on existing trust and network spillovers, enhancing peer pressure and solidarity, and thereby lowering the costs of lending to the poor (Feigenberg, Field and Pande, 2009). Nonetheless, on the other hand, social ties that are too strong might soften personal commitment if the group becomes more forgiving toward defaulters (Wydick, 1999; Guinnane, 1994). Van Bastelaer (2000) makes a comprehensive review of studies that try to ascertain the successful features of group lending. Self-selection, peer monitoring and peer pressure, deriving from the exploitation of horizontal networks, together with contingent renewal of the loan, are the most stated factors that explain the performance of group lending (Matin, 1997). According to this, information asymmetries are, therefore, overcome by transferring the information gathering task from the lender to the borrower. This task is reinforced by dynamic incentives where "…individuals have an incentive to repay the loan if they believe a critical mass of other members will do the same in order to receive future group loans" (Cassar, Crowly and Wydick, 2007, p.F90).

However, joint liability and contingent renewal are not always enforced (Van Bastelaer, 2000). Other social factors seem to emerge and justify the effectiveness of group lending. One factor regards the establishment of a vertical relationship between program officer and borrowers that further reduces residual information asymmetries and incentives problems (Van Bastelaer, 2000). This new relationship resembles the traditional patron-

client relationship and, hence, entails the creation of a new sort of trust and trustworthiness, respectively. Finally, the repeated commitment of every member to contribute, mandatory periodical meetings and other procedures foster a culture of norms and routines (Van Bastelaer, 2000). Similarly, Dowla (2005) also emphasizes these tenets.

Applied analysis of the dynamic incentives within the lending groups has been conducted through field experiments. Field experiments, either natural or "framed," reveal some common behavioral patterns. Field experiments often establish *a priori* rules and punishments that the participants of the games are acquainted with from the beginning, and data is collected on emerging behaviors, choices and results. There is some evidence of reciprocity that emerges from the games. If the individuals are better off in a period after a shock, they reciprocate by contributing more toward the repayment of the loan (Cassar, Crowly and Wydick, 2007; Cassar and Wydick, 2009).

Group lending can however have some drawbacks. Giné and Karlan (2008), discuss four limitations of group lending:

- group liability can create tension, which drives clients to drop out and harms social capital;
- if self screening of members is limited, "free riding" of bad clients can emerge;
- good or wealthier clients can be discouraged from borrowing and participating in the group given the expected costs of repaying for the others; and, finally,
- as clients in a group become more acquainted with their financial needs, they typically diverge in their demand for financial services.

These four possible pitfalls add to Besley and Coate (1995)'s suggestion that some group members have a disincentive to repay if the group as whole cannot.

In informal risk sharing there are comparable elements of lending groups. Self-selection of members, peer monitoring and peer pressure are also characteristics of informal risk sharing networks. Dynamic incentives also operate but in a different way. The incentives are not provided by the MFI in terms of loan renewal, but they are provided by the other members of the network in the form of expected reciprocal transfers.

In group lending, each group can therefore be regarded as a risk sharing network that is formal and where both types of incentives, provided by the MFI and by the other members, have to be present. In this framework, formal risk sharing arrangements established by loan contracts and informal risk sharing networks can coexist. Arnott and Stiglitz (1991) propose that this coexistence occurs because the arrangements complement one other. Informal insurance is identified in Arnott and Stiglitz (1991) as that part of insurance that is not provided by the formal market but by other informal actors (parents, friends, government, etc.). The formal market, unlike informal insurance, is characterized by the highest ability of risk-pooling, but might suffer from well-known problems of incentive incompatibility and moral hazard (Arnott and Stiglitz, 1991).

On the one hand, informal market institutions could be complementary to formal market institutions and increase the benefits of all participants if the monitoring and enforcement conditions are superior in the former market than in the latter. In this case, the premium and payout of the

formal insurance institution remain constant, and can even decrease (Arnott and Stiglitz, 1991). On the other hand, if the participants cannot observe each other's effort in reducing the subjective exposition to risk, the provision of informal insurance increases the probability of the insured event because it promotes further opportunistic behaviors. As consequence, formal insurance institutions must lower the payout for any level of the premium to continue to be profitable (Arnott and Stiglitz, 1991). Similar results can be drawn with reference to credit markets in presence of informal risk sharing networks. Thus, it is important to think of informal risk sharing networks as a medium for the exchange of both aid and information. The members identify, interaction after interaction, common rules and an established level of trust. Thus, theoretically, by providing information, informal risk sharing networks lower the search cost of creditors for a potential borrower, as this cost is shared among the members. Second, risk sharing networks also reduce the monitoring and enforcement costs for the lender because they take advantage of their informational advantage for avoiding opportunistic behaviors of the members. Besley (1995), in this regard, states that "…optimal form of contracts when information is incomplete and/or enforcement is a problem [for a lender] seems to look like a combination of credit and [informal] insurance" (Besley, 1995, p. 116). As an example of applied evidence, Okten and Osili (2004) find that, in Indonesia, community and family networks are important factors in an individual's search for a lender, and can also increase the probability of loan approval. Okten and Osili (2004) argue that the decision to participate in networks might also be influenced by lending and borrowing needs. In particular, they find that "…participation in community meeting increases the probability of applying for credit by 8 percent"(Okten and Osili, 2004, p. 1235), and the

probability of receiving credit increases by 6 percent. They also find that poorer people are more likely to benefit from social networks.

Even though informal networks might reduce informational asymmetries, informal networks can also be detrimental in the repayment of formal loans if informal linkages further bind the clients' ability to repay. In order to abide by the rules of an informal arrangement, the members might divert a portion of their loans away from productive activities and towards family and community needs. If this is the case, informal networks can cause inefficiency in the allocation of the available resources, including loans. As a result, one expects that lenders would be less willing to provide credit to individuals with strong family and community ties (Fafchamps and Minten, 2002).

Finally, in the interaction with formal credit, informal risk sharing arrangements are not crowded out as long as they are able to provide better information services than formal tools. However, as the financial institution gets to better know its clients in terms of their cash flows and personal trustworthiness, informal arrangements can break down. Similarly, as legal enforcement becomes available and reliable, social ties might not play a significant role in enforcement. According to Stiglitz (2000), the interaction between formal and informal market institutions leads, in the beginning, to a depletion of social capital as the legal framework becomes a substitute for norms and trust. This proposition means that informal networks, including informal risk sharing networks, become weaker. However, as long as institutional and socio-economic development takes place, new forms of social interactions are created to favor the building up of tacit knowledge and, hence, of a new type of social capital (Stiglitz, 2000).

Within this framework, informal risk sharing arrangements might resemble an informal guarantee fund where no contract exists but guarantors ought to be provided with sufficient incentives to bail out possible defaulters. It might therefore be appropriate to wonder if informal risk sharing arrangements can still exist in an environment where there are no information asymmetries. In this regard, for instance, as long as informal risk sharing arrangements provide contingent financial services not provided by the more formal financial intermediary, they might still play an important role. Hence, formal credit and informal risk sharing would be good complements. The theoretical model introduced and presented in the next section attempts to address this issue. It proposes a structure by which there are no problems of asymmetric information but where agents make their inter-temporal decisions on the basis of economic incentives among two financial instruments, formal credit or informal risk sharing. The main purpose is to model this formal-informal interaction and study to what extent informal insurance and formal credit are substitutes and to what extent they are complementary, provided that a likely trade-off exists.

7. An attempt of modeling the interaction between formal lending and informal risk sharing arrangements

7.1 The Village Economy

The theoretical model is a static model of a closed village economy where N inhabitants are farmers engaged in an agricultural activity, i.e. a crop-

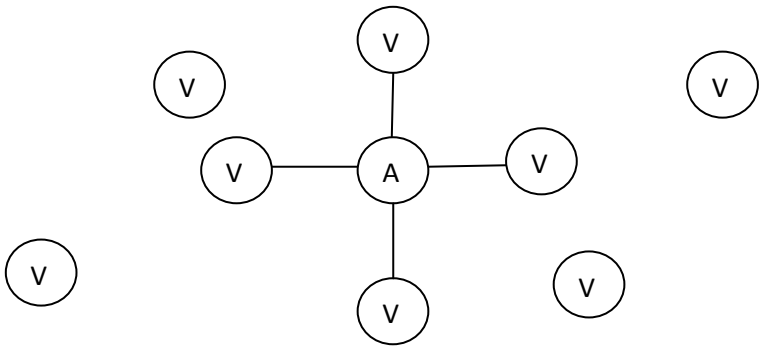
growing[24]. The village is made up of three agents: a villager *A*, the local MFI and "the rest of the village" (*V*s). The latter is a pseudo-agent consisting of all of the villagers but Villager *A*. We assume that the villagers in "the rest of the village" are homogenous in terms of preferences and income realizations, and hence can consider a representative villager *V*. From this, it follows that villager *A* is the only inhabitant who behaves differently in terms of investment and consumption decisions.

No informal risk sharing arrangements exist *per-se*, but they can be established according to existing economic incentives. This hypothesis is consistent with the literature on limited commitment. However, given that villager *A* is the only agent that behaves differently, she is also the only one to give and receive possible incentives for the stipulation to informal agreements (this is represented in Figure 3). Therefore, villager *A* would establish a risk sharing arrangement with the representative villager *V* if and only if the incentives constraint applies.

An MFI operates in the village. It can only provide loans, and during the first season of the year it decides how much credit to grant to each villager on the basis of his individual expected ability to repay. The MFI has limited financial resources and can only provide credit to a restricted number of villagers. Thus, credit rationing exists. Even though each villager *V* would receive the same amount of loan, villager *A* would receive an amount of loan based on her dissimilar expected ability to repay.

[24] Livestock raising might also be considered.

Figure 3 – Graphical representation of the informal risk sharing network, where only A has economic incentives to create links and some Vs are provided incentives only with respect to A.



In the village economy, the planting and harvesting activities are carried out twice a year. The first season's harvesting and the second season's planting take place at the same time. Period 1 is thus defined as the period in which the second season's planting decision is made. In period 1, villager A earns a certain income, y_A, and decides how much to invest, k_A, in the new planting activity[25]. Similarly, the representative villager V earns a certain income, y_V, and decides how much to invest in the next season, k_V. Aside from the income she has decided to invest, villager A likely receives other external transfers: a loan, L_A, from the MFI, and a transfer, τ_{AV}, from the representative villager V. Note that the transfer between A and V might be either positive or negative.

Each villager V also receives a loan, L_V. Because these villagers are homogenous, if the MFI grants n loans, where $n \leq N$, each villager V has

[25] Let's think, for instance, of a farmer that raises potatoes and has to decide how many potatoes to consume and how much potatoes to replant.

an $(n-1)/N$ probability of receiving a loan and $1-[(n-1)/N]$ probability of being excluded from borrowing.

The total sum of transfers in period 1 is given by $\tau_{AV}m$, where m is the number of transfers or links created by villager A in period 1.

The number of links established in the informal risk sharing network and the amounts of the certain and expected transfers are determined in the first period when the informal contract is made. The informal contract between A and every V is, therefore, an array of possible transfers $[\tau_{AV}^{1}, \tau_{AV}^{2}, \ldots, \tau_{AV}^{\infty}]$ that corresponds to each combination of possible income realizations of A and V in period 2, in exchange for a certain transfer, τ_{AV}, in period 1. This is comparable to a forward contract but, in this case, the expected exchange in the future has uncertain occurrence and amount. Therefore, given the limited commitment feature, participation constraints for both A and V must be such that they abide by the informal contract. The participation constraints are economic incentives, that is, the higher expected utility achieved from participating in the informal arrangement. This issue is discussed below.

If it is supposed that the farmers' decisions are utility maximizing, villager A's utility in period 1 is determined by:

$$U_A^1 = u(y_A + L_A + \tau_{AV}m - k_A)$$

Whereas, villager V's utility in period 1 is determined by:

$$U_V^1 = (n - 1/N)u(y_V + L_V - \tau_{AV} - k_V) + \big(1 - (n - 1/N)\big)u(y_V - \tau_{AV} - k_V)$$

When consumption and investment decisions are made, the first period ends.

In period 2, every villager observes his respective income realizations. The income realizations of A and V are brought about, respectively, by a certain realization, $(1+\alpha)k_{A,V}$, dependent on the amount invested in the first period and an i.i.d. idiosyncratic income shock, $\epsilon^{i}_{A,V}$, where α is the total factor productivity. Period 2 is when the repayment of the loan is due. The loan-plus-interest amount to be repaid is $(1+i_A)L_A$ and $(1+i_V)L_V$, respectively.

According to this framework, in period 1, villager A's expected utility in period 2 is determined by:

$$EU^2_A = Eu\left[(1+\alpha)k_A + \epsilon^i_A - (1+i_A)L_A + \tau^i_{AV}m\right] \quad , i = 1, \dots, \infty$$

Whereas, in period 1, villager V's expected utility in period 2 is determined by:

$$EU^2_V = (n-1/N)Eu\left[(1+\alpha)k_V + \epsilon^i_V - (1+i_V)L_V - \tau^i_{AV}\right] + \left(1-(n-1/N)\right)Eu\left[(1+\alpha)k_V + \epsilon^i_V - \tau^i_{AV}\right] \quad , i = 1, \dots, \infty$$

The stochastic shock and, hence, its distribution, is fundamental in determining the distribution of possible risk sharing transfers, the amount invested in the first period and the amount consumed in both periods. At the same time, it affects the financial decisions of the MFI.

According to this framework, there might be four possible outcomes:

1. Only risk sharing exists;
2. Only autarky exists.
3. Both lending and informal risk sharing exist; and
4. Only lending exists;

Every outcome is mutually exclusive and occurs when the associated utility is higher than that of the other outcomes.

The third and fourth cases are presented and discussed in the next section. With regards to first outcome, when no formal borrowing is available but only risk-sharing exists, the maximization problems of the two villagers become:

for villager A,

$$\overline{U}_A^{NL} = Max\, u(y_A + \tau_{AV}^{NL} m^{NL} - k_A^{NL}) + \delta Eu\left[(1+\alpha)k_A^{NL} + \epsilon_A^i + \tau_{AV}^{i,NL} m^{NL}\right]$$

s.t.

$$h_A^{NL}:\ u(y_A + \tau_{AV}^{NL} m^{NL} - k_A^{NL}) + \delta Eu\left[(1+\alpha)k_A^{NL} + \epsilon_A^i + \tau_{AV}^{i,NL} m^{NL}\right]$$

$$Positivity\ Constraint: k_A^{NL}, m \geq 0$$

and, respectively, for villager V,

$$\overline{U}_V^{NL} = Max\, u(y_V - \tau_{AV}^{NL} - k_V^{NL}) + \delta Eu\left[(1+\alpha)k_V^{NL} + \epsilon_V^i - \tau_{AV}^{i,NL}\right]$$

s.t.

$$g_V^{NL}:\ u(y_V + \tau_{AV}^{NL} m^{NL} - k_V^{NL}) + \delta Eu\left[(1+\alpha)k_V^{NL} + \epsilon_V^i - \tau_{AV}^{i,NL} m^{NL}\right] \geq \overline{U}_V^A$$

$$Positivity\ Constraint: k_V^{NL}, m \geq 0$$

On the other hand, when neither formal borrowing nor informal risk sharing arrangements are available, both villagers live in autarky and their maximization problems become:

for villager A, $\bar{U}_A^A = u(y_A - k_A^A) + \delta E\left((1+\alpha)k_A^A + \epsilon_A^i\right)$

and, respectively, for villager V, $\bar{U}_V^A = u(y_V - k_V^A) + \delta E\left((1+\alpha)k_V^A + \epsilon_V^i\right)$

Finally, in the third case, when credit is available and risk sharing arrangements are feasible, the maximization problem for villager A is:

$Max\ U_A^1 + \delta E U_A^1$

s.t.

h_A: $U_A^1 + \delta E U_A^1 \geq \bar{U}_A^A$

$Positivity\ Constraint$: $L_{A,}m \geq 0$

and, respectively, for villager V,

$Max\ U_A^1 + \delta E U_A^1$

s.t.

g_V: $U_A^1 + \delta E U_A^1 \geq \bar{U}_A^A$

$Positivity\ Constraint$: $L_{A,}m \geq 0$

7.4 The decision problem of the MFI

It is hypothesized that the MFI can only provide credit. No savings products are available in the village economy. Notwithstanding, according

to the above described framework, the villagers can save and invest part of the first season's production.

The MFI is a client-maximizer, that is, it maximizes outreach subject to a financial sustainability constraint and a participation constraint for both villager *A* and villager *V*.

Loans incur a fixed-cost per loan, *c*. Moreover, given that deposit mobilization is not allowed, the MFI wholly finances its lending activity through external funding, *F*, that might be costly. The cost of the external funding, *r*, cannot be determined by the MFI (i.e., there is a price-taking assumption).

Hence, the maximization problem of the MFI is:

$Max\ n$

s.t.

BC λ_1: $[(1+i_A)L_A + (n-1)(1+i_V)L_V] \geq (1+r)F + cn$

PC$_A$ λ_2: $u(y_A + L_A + \tau_{AV}m - k_A) + \delta \mathrm{E}u\left((1+\alpha)k_A + \epsilon_A^i + \tau_{AV}^i m -$

$1+iALA \geq UANL$

PC$_V$ λ_3: $\left(n - \frac{1}{N}\right)\left[u(y_V + L_V - \tau_{AV} - k_V) + \delta \mathrm{E}u\left((1+\alpha)k_V + \epsilon_V^i - \tau_{AV}^i -\right.\right.$

$1+iVLV+1-n-1/NuyV-kKV+\delta \mathrm{E}u1+\alpha kV+\epsilon Vi \geq UVNL$

$Resource\ Constraint$: $L_A + (n-1)L_V \leq F$

$Positivity\ Constraint$: $L_A, L_V, i_A, i_V, n \geq 0$

$Client\ constraint$: $n \leq N$

Recall that in the fourth case, no informal risk sharing arrangements are feasible. Here, the maximization problem scales down to a problem of contracting between the MFI and each farmer, where the MFI maximizes the number of clients served subject to a budget constraint and a participation constraint for every villager. The maximization problem is as follows:

$Max\ n^{NR}$

s.t.

BC λ_1: $[(1+i_A^{NR})L_A^{NR} + (n^{NR}-1)(1+i_V^{NR})L_V^{NR}] \geq (1+r)F + cn^{NR}$

PC_A λ_2: $u(y_A + L_A^{NR} - k_A^{NR}) + \delta \mathrm{E}u\left((1+\alpha)k_A^{NR} + \epsilon_A^i - (1+i_A^{NR})L_A^{NR}\right) \geq \overline{U}_A^A$

PC_V λ_3: $(n-1/N)\left[u(y_V + L_V^{NR} - k_V^{NR}) + \delta \mathrm{E}u\left((1+\alpha)k_V^{NR} + \epsilon_V^i - 1+iVNRLVNR+ 1-n-1/NuyV-kVNR+\delta \mathrm{E}u1+\alpha kVNR+\epsilon Vi \geq UVA\right.\right.$

$Resource\ Constraint$: $L_A + (n-1)L_V \leq F$

$Positivity\ Constraint$: $L_A, L_V, i_A, i_V, n \geq 0$

$Client\ constraint$: $n \leq N$

7.3 Expected results

According to the model, the interaction between informal risk sharing and formal lending would give rise to different outcomes depending on the level of risk aversion, the discount factor, the total factor productivity, the transaction costs and the cost of external funding for the MFI. In particular, even though the transaction costs are borne by the MFI, they

are reallocated between the financial institution and the farmers through the pricing process.

The discussion stems from the proposition that the financial intermediary and the informal networks can likely bring about reciprocal incentives and their financial products, respectively, can, therefore, be either complements or substitutes.

It is expected that when interest rates decrease or the amounts granted increase, the farmers will create more links or transfer a greater amount through the established network because of largest available resources. However, the inverse relationship might also be true. That is, when farmers set up new risk sharing arrangements with other farmers or decide to transfer more than in previous periods, the intermediary might consider the clients more creditworthy and, hence, grant a greater amount per loan or reduce the applied interest rates. This case would, when it applies, show a complementary effect between credit and informal risk sharing.

Notwithstanding the possible positive relationship between the described formal and informal institutions, different risk and time preferences or higher lending costs can lead the farmers to make opposite decisions. If interest rates increase, farmers might transfer more to increase other farmers' ability to repay as the cost of borrowing increases. Or, similarly, when the amount borrowed increases, it can be less necessary to make use of the informal networks for transferring contingent resources. This latter case would suggest a substitution effect between credit and informal risk sharing.

The possible outcomes and relationships are studied through the resolution and analysis of a simplified model.

7.4 A simplified model and an applied example

As long as there are no costs associated to the establishment of new risk-sharing agreements, it is possible to simplify the model above to a two-person game and draw conclusions that can easily be extended to the general model. In particular, let us maintain the same feature of full information but suppose that only one of the two farmers in the arrangement has access to credit.

In absence of risk-sharing opportunities, the ratio of the marginal utilities between the two periods must be equal to the discount factor, δ, times the cost of borrowing, $g'(L_{i,t})$, i.e., the time-preference of consumption and the interest rate would explain all inter-temporal allocation of consumption between the two periods:

$$\frac{U'_{i,t}}{EU'_{i,t+1}} = \delta g'(L_{i,t}), \quad i = 1,2$$

where $L_{i,t}$ is the amount borrowed by farmer *i*.
However, if risk sharing opportunities are available, then the F.O.C. becomes

$$\delta g'(L_{1,t}) = \delta g'(L_{2,t}) = \frac{U'_{1,t}}{EU'_{1,t+1}} = \frac{U'_{2,t}}{EU'_{2,t+1}} = \frac{1+\lambda_2}{1+\lambda_1}\frac{U'_{2,t}}{EU'_{1,t+1}}$$

that is, as the cost of borrowing increases, the participation constraint becomes further binding for the agent that receives the loan, relative to that of the other agent. This means that if the opportunity cost of consuming now increases (i.e. the cost of borrowing decreases), the gains deriving from participating in the risk sharing network must be greater to maintain the same level of incentives. Similarly, if the borrowing cost decreases, the non-borrowing agent must provide more incentives in terms of transfers to the borrowing agent for the borrowing agent to remain in the arrangement.

Let's use an example to analyze the relationship between the existence of borrowing opportunities and risk sharing transfers. Suppose we have the following case:

Farmers maximize a Constant Relative Risk Aversion (CRRA) utility function over two periods (t and t+1). Incomes of both farmers are normally distributed with means [50, 200] and correlated according to the following variance-covariance matrix: $\begin{bmatrix}400 & 50\\ 50 & 400\end{bmatrix}$. The current income realizations are [200, 50]. The risk aversion parameter is set at 0.5 and the discount factor is 0.7.

The stochastic model does not have a closed-form solution and is solved employing simple computational methods.

In particular, the example can illustrate the relationships between borrowing costs and the availability of credit and farmers' financial decisions with respect to borrowing, as well as to the amounts exchanged in the informal risk sharing arrangement.

Figures 4 and 5 depict the effect of borrowing constraints on participation in the informal risk sharing arrangement for two interest rates, 5 and 15 percent, respectively. As borrowing constraints loosen, amounts transferred from farmer to farmer decrease while the utility of both participants increases. This result suggests that the farmer with the lower current income realization offers incentives to the other farmer, in terms of a looser participation constraint, to remain in the arrangement, while she also enjoys higher utility due to the ability to borrow more. In the limit, the levels of borrowing and transferring stabilize and are determined by the difference in income realizations, expected income realizations and the discrepancy between the discount factor and the interest rate.

Interest rates (Figure 6), on the contrary, have a positive effect on current and future transfers but the utility of each farmer decreases as the cost of borrowing increases. In addition, there exists a cut-off interest rate, r^*, above which no borrowing takes place.

Finally, farmers jointly decide on the quantity of transfers to make in the risk sharing arrangement. The agent who has a low expected realization of income in the next year is encouraged to make a larger transfer in the current period because she expects a reciprocal transfer the next year. However, as long as formal borrowing is available or its cost decreases, the incentives to participate in the informal arrangement decrease for the farmer who has a low realization of income in the current period. Although there are disincentives to participation in the risk sharing agreement when borrowing costs decrease, utilities of both farmers increase in this case. The access to credit, therefore, increases the efficiency of the risk sharing networks because it provides incremental funding to one farmer and eases the participation constraint of the other farmer in the

informal arrangement. The amounts exchanged between farmers shrink but reciprocal transfers continue to exist as they are interest-free sources of funding. If, however, the interest rate is relatively too low, the incentives to participate in the informal arrangement for the farmer who suffered an adverse shock in the current period would disappear, and the informal arrangement would break down.

Figure 4

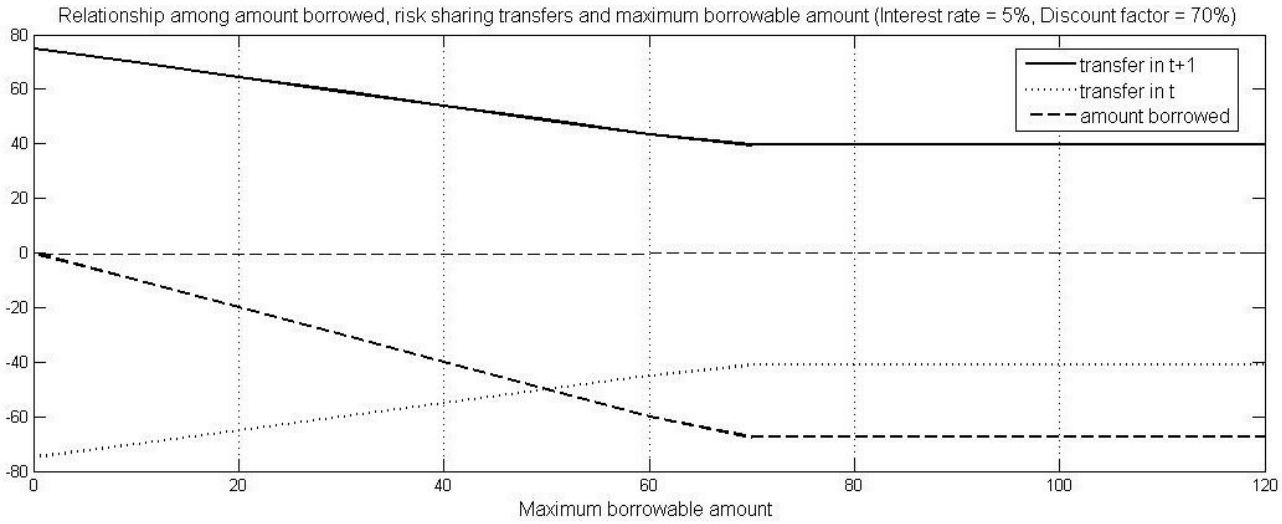


Figure 5

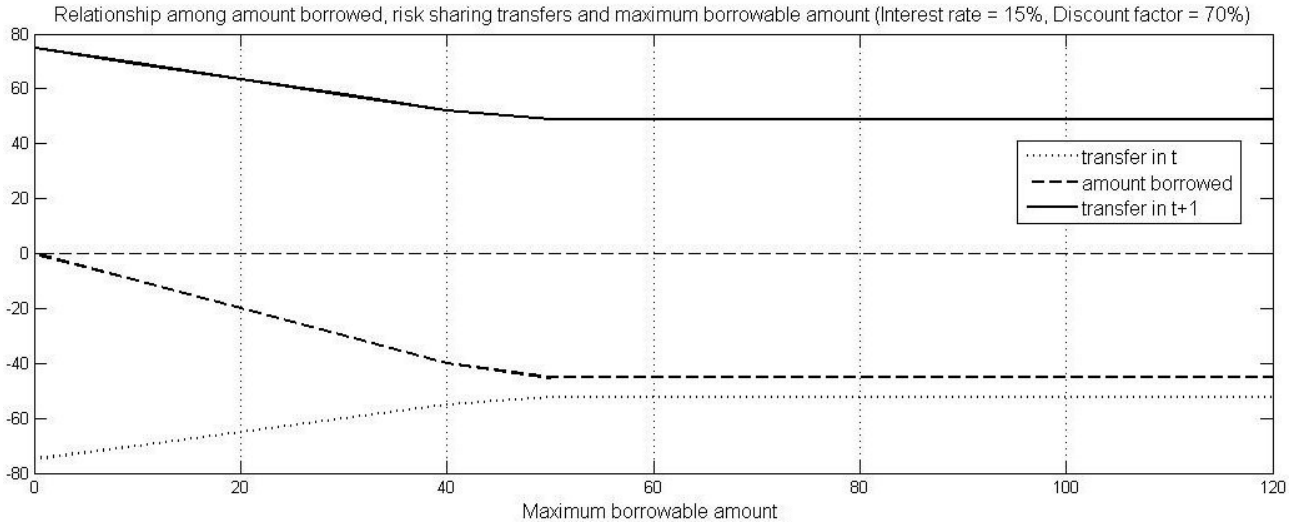
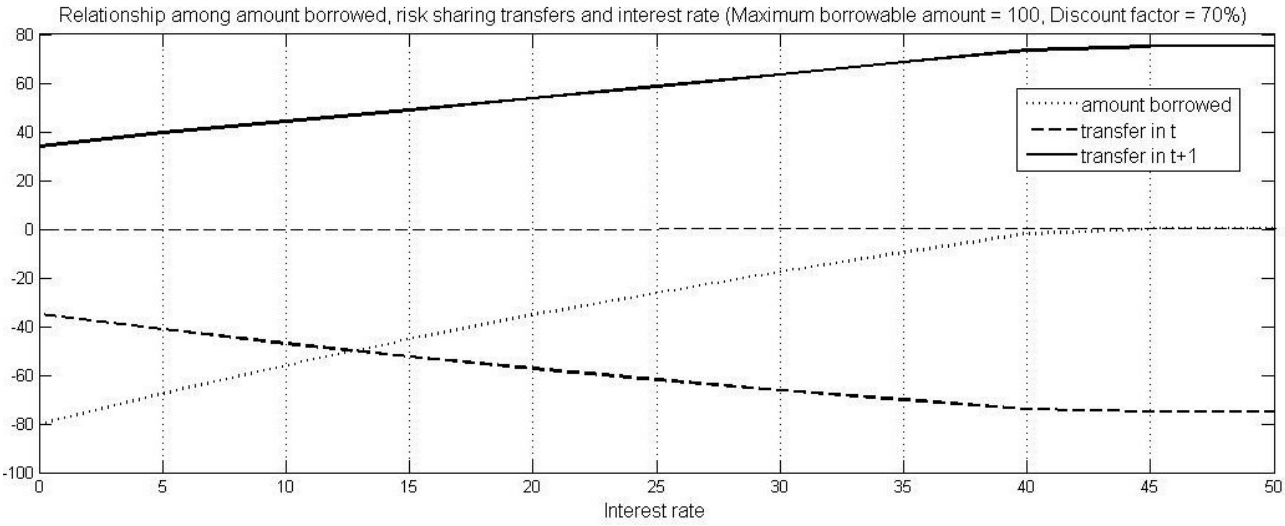


Figure 6



8. Conclusions

MFIs and financial intermediaries that operate in rural areas of developing countries, although they do not work directly with informal financial institutions, have to be cognizant of the existence of informal arrangements and the side-effects of providing formal financial services to poor rural dwellers.

In this study, an attempt has been made to model and discuss the interaction of formal lending and informal risk sharing arrangements. The results suggest a beneficial effect of the formal lending on both the borrower and her partner in the informal arrangement as long as the cost of borrowing exceeds a relative threshold. The model does not, however, take into consideration the possible informational advantages of the informal arrangement and the lower transaction costs. In addition, the model is based on simple principles of utility maximization and does not consider possible losses of social capital in terms of trust and social norms.

Future developments of the model must, therefore, consider the emergence of norms and trust, and an agent-based model can be more appropriate in this case. This approach would likely allow the study of how formal intermediaries should interact with informal risk sharing groups without compromising the existence and development of social capital.

Another necessary improvement regards the consideration of several financial products, such as deposits and insurance, and how they compete with or complement informal financial products.

In the case of savings, the possibility of saving in a "cash-in-advance" account that offers an average, state-contingent return[26] will undo any risk-sharing contract in the absence of explicit breach penalties (Bulow and Rogoff, 1989).

Finally, the pricing policy of MFIs or of other formal rural financial intermediaries can be a critical factor in determining whether the informal financial arrangements survive or breakdown. Rural formal financial intermediaries that are greatly subsidized –with direct effects on the pricing policy--, as well as temporary credit schemes that charge low interest rates, can jeopardize the local informal financial market without increasing the efficiency of the local financial market as a whole. The shrinking of the informal financial market can also entail a loss of social capital in terms of less social norms and trust. If MFIs and rural financial institutions want to increase outreach and generate impact, they have to

[26] of $(1/\delta) - 1$

create partnerships with informal arrangements--possibly by providing technical assistance and funding (Nagarajan and Meyer, 2006). Funding, in particular, is intended to enlarge the lending capacity of informal intermediaries that is usually small and unsteady. The still open question is how to accomplish such a goal in a sustainable fashion, while reaping the benefits of the existing information advantages and social capital.

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Interaction between Risk Sharing Transfers and Formal Borrowing: A Multilogit Approach Analysis and Evidence from Ethiopia

1. Introduction

Ethiopia, one of the poorest countries in the world, is exposed to several natural shocks. These characteristics, together with weak institutional capacity and a poor infrastructure network, are detrimental in the expansion of the formal financial system into rural areas. Microfinance institutions (MFIs) and some rural cooperatives are, however, currently providing financial services to rural clientele, even though 80 percent of the population remains unserved by formal intermediaries (Peck and W/Yohannes, 2009). This unserved population resorts to indigenous informal financial intermediaries, such as *Iddirs* and *Iqqubs*, and risk sharing networks of friends and relatives. Where formal financial service providers are present, it is often the case that formal and informal intermediaries coexist with seemingly no crowding out effects; this is likely a result of the fact that rural households may still resort to informal financial sources, even when they have access to formal sources (Dejene, 2003; Viganò *et al.*, 2007).

The coexistence of formal and informal intermediaries has been studied in other developing countries, but few studies have attempted to make a comparative analysis of different financial entities and the financial decisions of rural households in Ethiopia (examples are Dejene (1993a)

and Viganò *et al.* (2007)). The objective of these studies was not, however, to explain the financial decisions of rural households when faced with diverse alternatives. This objective, among others, is pursued here. Segers et al. (2010) use an anthropological perspective to pursue a similar question. The authors study the interaction between MFIs and informal institutions in the Tigray region of northern Ethiopia, focusing on how access to microcredit has changed the organization and use of informal financial arrangements.

The analysis carried out here aims, in particular, to explain the dynamic interactions between microfinance institutions and informal financial risk sharing networks. The transfers in the risk sharing networks are characterized by a zero interest rate and expected reciprocity, which implies underlying trust and shared values; due to the unique nature of informal risk sharing arrangements, this social dimension is often absent in the relationship between individuals and formal financial institutions. This hypothesis allows for the investigation of how social and economic factors explain the coexistence of both types of financial sectors.

In order to study the interaction between the two sectors from a client perspective, data from a rural village in southern Ethiopia was collected and a multilogit regression model was estimated, the results of which will be discussed subsequently.

This paper is organized as follows: Section 2 presents a brief review of the literature on the dichotomy of rural financial markets in developing countries; Section 3 describes the Ethiopian financial system; Section 4 discusses the data; Section 5 discusses the characteristics of the financial system in the surveyed village; and Sections 6 and 7 review the literature

on risk in rural areas and empirically analyze the exposure to risk of Ethiopian farmers; finally, Sections 8, 9, and 10 present the theoretical model, explain the methodology and discuss the results; Section 11 offers concluding comments.

2. Dichotomy of rural financial markets in developing countries: evidence from the literature

Rural financial markets in developing countries are segmented. Often, both formal and informal actors and intermediaries coexist and, in some cases, even thrive in parallel. However, the distinction between the two markets is not straightforward and the presence of a semi-formal sector (Mauri, 2000) establishes a continuum between formal and informal. Nonetheless, regardless of how rural financial markets are classified, both formal and informal characteristics remain.

Even though some studies, such as Hoff and Stiglitz (1990), point to informational advantages to explain the survival and prosperity of the informal sector where it has not been crowded out by formal intermediaries, other studies and newly available data on rural financial markets have revealed that the picture is more complex, with several elements interacting. First, if informal lending is to be explained only through some monopoly power derived from living in the same community of the borrowers or from quantity rationing in the formal market (Bell *et al.*, 1997), the regular exchange of zero interest loans among rural dwellers would not find any rational explanation. Second, if segmentation of rural financial markets is endemic to the region, a careful

analysis of all possible explanations has to be carried out. Third, segmentation could be caused by more than one factor. According to Mauri (2000) and Adams and Fichett (1992), informal financial markets in developing countries are multifaceted. The informal sector matches social and economic elements and, hence, rests on bonds with the local culture; it preserves traditional shared values, pays respect to family relationships, and strengthens solidarity at village and ethnic group level (Mauri, 2000). Moreover, the informal sector arises from the necessity to fill the gaps left by inefficiencies and failures of governments and policies (Mauri, 2000). Therefore, if informal financial intermediaries are structured and organized with regards to the social and economic objectives they have to pursue, a multi-factor analysis is necessary.

The studies that have attempted to explain the dichotomy of rural financial markets in developing countries have been focused on institutional, economic and social factors.

Tsai (2004), citing evidence from India and China, proposes three explanations for the persistence of the informal sector. First, credit demanded by rural households exceeds that supplied by the formal financial sector, leaving some space for informal finance. This observation is confirmed by Swain (2002), who suggests that informal credit in India is due to a combination of limited access to formal credit and a high demand for such credit. Similarly, citing evidence from China, Park and Ren (2001) find that the overall level of indebtedness is higher among microfinance clients than clients of other rural lenders, suggesting that farmers are constrained at the margin—i.e., the supply of formal rural financial services does not suffice.

Second, Tsai (2004) suggests that, in Asia, formal intermediaries are not fully able to identify their intended clients. Commercial banks do not have sufficient institutional experience to downscale, and governmental banks follow a quantity objective and do not effectively provide financial services tailored to the demand of the poor[27]. Besides, state actors intentionally divert credit from the intended recipients, and non-state actors may distort and meddle with the provision of formal credit. As suggested and documented in Adams *et al.* (1984), subsidized loans have usually ended in the hands of local political and social elites. The result is a segmentation of financial services along political and social lines. The same occurs for insurance products.

Third, Tsai (2004) suggests that the dichotomy in rural financial markets may also reflect variation in investment and consumption preferences across consumers from different economic strata as well as differences in institutional design and lending methodology between formal and informal intermediaries. As such, informal credit services might be more attractive due to its characteristics, including the size of loans, the repayment terms, and lower direct and indirect transaction costs.

With reference to transactions costs, Guirkinger (2006) notes that, in Peru, the informal sector clients are farmers that have been rationed by formal intermediaries but, at the same time, believe that the informal financial contracts are less risky lower transaction costs despite their higher interest rates. This latter proposition would indicate a lower net cost for informal services. Guirkinger (2006) also offers other reasons for the prevalence of

[27] The literature on the experiences of banks in downscaling is vast. There are successful experiences in downscaling in many countries. Westley (2006) reviews the strategies and structures of commercial banks involved in microfinance activities. The study proposed here is not, hence, exhaustive, but the objective is to introduce the issue.

the informal sector: informal lenders have informational advantages in screening, monitoring and enforcing, and also take advantage of economies of scope that stem from the interlinking of credit with other activities. Finally, informal intermediaries overcome various forms of non-price rationing and offer more flexible financial services.

Moreover, potential borrowers in the formal sector can also be rationed for being too poor. Besley *et al.*(2001) find that rural Nepalese households simultaneously resort to both formal and informal financial sector due to some wealth effect; that is, higher income rural households access the formal market more easily, including facing lower cost of physical travel. In fact, geographical distance appears to be a significant segmentation factor in local Nepalese rural credit markets.

Even though institutional deficiencies, market failures and other economic factors can explain most of the dichotomy in underdeveloped financial markets, social and cultural factors must also be considered. Turvey and Kong (2010) compare the market of zero interest credit services in China, where loans are provided by relatives and friends, with microcredit services of formal intermediaries. They find that both trust between borrower and lender and social preferences in borrowing are relevant factors that define the source and the destination of the loan. As long as reciprocal trust between relatives or friends increases, Turvey and Kong (2010) say the preference for the informal sector strengthens, and expected reciprocity in zero interest credit market eases the expected liquidity constraints.

If trust and social relations in the informal market are relevant, formal financial services that are developed in order to tap relational advantages

of the local social structure dramatically reduce the transaction costs on the demand side and can exploit pre-existing mechanisms of screening, monitoring and enforcing. For instance, with regards to group lending, Zeller (1994) finds that, in Madagascar, the leverage ratio in the informal sector is a screening criterion of new potential borrowers in both formal and informal group lending, suggesting that community-based groups have an information advantage similar to that of informal lenders.

3. Financial system and risk sharing arrangements in Ethiopia

Ethiopia is among the poorest countries in the word, with a GDP per capita of $318.70 (2008) and a life expectancy at birth of 55.8 years. Agriculture is the main economic sector and represents 45 percent of GDP and 85 percent of the labor force[28]. However, over the last ten years, real GDP has increased to more than three times (by 217 percent) and real GDP per capita to nearly three times (by 182 percent) (NBE, 2010). The financial system has experienced a more marked growth. For instance, the total net domestic credit has increased to more than four times since FY 1998/1999 (NBE, 2010).

In 1994, after the end of the socialist regime, the Ethiopian financial system began to be privatized. However, the presence of the government in the financial sector has remained significant. The Ethiopian financial system comprises both formal, semi-formal and informal financial institutions. All financial sectors coexist, are vital, and are expanding. The formal financial sector, supervised by the National Bank of Ethiopia (NBE), comprises the

[28] Data from https://www.cia.gov/library/publications/the-world-factbook/geos/et.html (CIA, The World Factbook) and http://data.un.org/CountryProfile.aspx?crName=Ethiopia#Economic (UNdata).

banking system, the insurance sector and the MFI sector (NBE, 2010). According to the NBE report on FY 2008/2009, there were 10 private and 3 state-owned banks operating in the country (NBE, 2010)[29]. While branches of private banks made up 57 percent of the total, about 63 percent of the capital in the banking sector was in the hands of the state-owned banks. Nearly 56 percent of bank branches were located in Addis Ababa, the capital city. During the same period, 12 insurance companies were present in Ethiopia, with more than 50 percent of their branches in Addis Ababa.

Commercial banks and insurance companies are almost absent in rural areas, except for some government banks that, however, do not serve small farmers (Viganò *et al.*, 2007). Financial intermediaries that are intended to play such a role are the MFIs[30].

The microfinance sector was formally regulated with Proclamation n. 40/1996, in response to previous unsuccessful rural credit schemes carried out by local governments and NGOs (Viganò *et al.*, 2007). The proclamation has since been followed by additional directives. The microfinance regulation requires a minimum paid up capital of ETB 200,000 (€ 11,320) and special provisions and licensing for MFIs that reach a deposit balance of ETB 1 million (€ 56,600). Some specific directives about the lending policies of MFIs used to exit but most have been removed.

[29] Here, for the sake of maintaining consistency with NBE, only intermediaries supervised by the NBE itself are defined formal. The other regulated intermediaries fall into the semi-formal category.
[30] Savings and credit cooperatives are also expanding their activities in rural areas as discussed below.

There were 28 active MFIs at the end FY 2008/2009, with total capital of ETB 1.7 billion (€ 96.2 million) and total assets of ETB 6.6 billion (€ 373.56 million). The total amount of deposits reached ETB 2.1 billion (€ 118.86 million) and the total amount of loans was ETB 4.9 billion (€ 277.24 million). However, the two largest MFIs, the Amhara Credit and Savings Institution and the Dedebit Credit and Savings Institution, made up about 54 percent of total capital, nearly 60 percent of total deposits and 64 percent of total assets (NBE, 2010).

The data on outreach and financial performance of MFIs is only available for 23 MFIs that belong to the Association of Ethiopian Microfinance Institutions (AEMFI) (Peck, 2010). Between December 2005 and December 2009, the number of active borrowers increased from 1.27 million to 2.2 million, and the outstanding loan portfolio and savings balance nearly doubled over the same period (Peck, 2010). This dramatic increase is mainly attributable to the seven-year initiative called the Rural Intermediation Program (RINP). Notwithstanding this outstanding performance, none of the MFIs considered in the financial analysis of Peck (2010) were financially self-sustainable in FY 2008/2009. The average ROE and ROA were 5 percent and 1 percent respectively. The average operational self-sufficiency ratio was 119 percent but, after inflation and subsidy adjustments, the ratio, i.e. financial self-sufficiency ratio, was 52 percent[31].

According to a 2008 analysis of Ethiopian MFIs, Peck and W/Yohannes (2009) state that the self-sustainable MFIs turned out to have some peculiar characteristics. On average they had 25 percent lower operating

[31] The break-even point is at 100 percent.

costs, 8.8 times more deposits, 5.5 times more borrowers and 38 percent more clients per loan officer (Peck and W/Yohannes, 2009). These facts suggest that Ethiopian MFIs have to pursue economies of scope and scale in order to reach self-sustainability and, as suggested by Viganò *et al.* (2007), raise interest rates in order to reduce reliance on grants and subsidized loans.

The formal sector is flanked by other regulated financial institutions, including savings and credit cooperatives (SACCOs), that are not under the supervision of the NBE but instead are supervised by the Cooperative Bureau, which directly reports to the Federal Cooperative Agency. SACCOs were formally regulated by Proclamation 147/98 on cooperative societies. Similar to MFIs, thanks to the recent contributions of the RINP, the number of SACCOs grew from 35 in 1974 to over 5400 in mid 2006, with a total of 381,000 members (Kassa *et al.*, 2007). 53 percent of the SACCOs were established in Addis Ababa. Out of the total number of SACCOs, 1,166 (21 percent) are rural savings and credit cooperatives (RUSACCOs). The members of RUSACCOs grew from 17,000 in 2004/2005 to 64,655 in mid 2006. In mid 2006, the deposit balance per member was ETB 137 (€ 7.75).

It's worth noting that, in FY 2004/2005, SACCOs had a total deposit balance that was twice that of MFIs (Kassa *et al.*, 2007). SACCOs tend to concentrate on savings mobilization (Viganò *et al.*, 2007), and their loan requirements are more strict than for MFIs. In RUSACCOs, for instance, borrowers must have kept savings on deposit for at least 12 months and loans have to be fully guaranteed by savings or guarantors.

Besides banks, MFIs and SACCOs, there exist other financial intermediaries and arrangements that, except in a few cases, carry out informal financial transactions that are not tracked in the regulatory system[32]. The existing informal sector can be classified according to the level of organizational complexity. The most prevalent structured informal financial institutions are the *Iqqub* and the *Iddir*; the former is a rotating savings and credit institution (ROSCA) and the latter is an insurance party. Unstructured institutions, or those simply based on kin, family or friendship relationships, are the informal risk sharing arrangements that entail the transfers of gifts, money or labor in case of necessity as well as no or low interest rate loans with short maturities. However, structured risk sharing arrangements also exist and are very present in Ethiopia, such as oxen sharing and labor parties. These parties, even though they are not financial institutions, can be regarded as risk management arrangements similar to other financial arrangements[33].

The *Iqqub* is classified as a ROSCA. In ROSCAs, savings are accumulated in a common pool and then allocated to members according to established rules[34]. ROSCAs allow members to have access to some sort of financial services in spite of the rigidity and higher transaction costs of the formal sector. In rural Ethiopia, *Iqqubs* allow poor farmers to save despite their low level of income (Dejene, 1993a).

[32] There are some ongoing projects that aim at linking these institutions with the formal sector (Viganò *et al.*, 2007).
[33] In economies where the financial sector is incomplete, or almost absent, and the level of monetization is low, in-kind transactions end up being the only available tools for managing risk.
[34] The literature on ROSCAs is vast.

ROSCAs are built on social rules and reputation of their members, and take advantage of reduced informational asymmetries by discouraging uncreditworthy newcomers to join.

According to Dejene (2004), the main characteristic and advantage of *Iqqubs* is flexibility--flexibility can concern the time when the *Iqqub* is formed, the amount of contribution, the frequency of payment, the loan destination and the number of possible memberships to other *Iqqubs*. Flexibility also includes the ability to try innovative solutions to problems such as members' default, inflationary pressure, transaction costs and shocks (Dejene, 1993a; Dejene, 2004). For instance, in case of increasing inflation "...*Iqqubs* have devised different mechanisms including: a) the practice of fixing variable "price" of *Iqqub* (i.e. the "implicit interest" charged declines with the length of the cycle); b) those who collect their shares at the end of the cycle are compensated with funds raised through deduction of shares of early winners (Dejene, 1993a); and c) in some rural areas, *Iqqub* is paid in-kind..." (Viganò *et al.*, 2007, p. 118).

In the *Iqqubs*, common resources are allocated by a lottery system, by auction or by consensus. However, *Iqqubs* can also meet contingent needs of members and allocate funds based on urgency of each participant (Dejene, 2004). The *Iqqubs* are mainly informal financial institutions, since they are not regulated or supervised by a governmental body. However, all *Iqqubs* have well-defined policies and structure. Some *Iqqubs* have written by-laws, may require guarantors for new members or may set up emergency funds for its members (Dejene, 2004).

Iqqubs are most common in urban areas (Dejene, 2004), but are also present in rural areas. Dejene (1993a) finds that in rural Ethiopia 17 percent of total

farm households in the highlands are members of *Iqqubs*, whereas Viganò *et al.*(2007) find a percentage of 9.6 with a wide variation of 2 to 38 percent among the administrative zones (*woredas*) considered in their study. The authors also find that monthly contributions vary from ETB 3.5 to ETB 41, with an average of ETB 16 and an average leverage ratio of 16[35].

Iddirs, the other structured informal financial institution, are more common in rural areas than urban area. *Iddirs* are insurance parties whereby members pay a premium periodically, usually weekly, fortnightly or monthly, and receive a payout when an insured event occurs[36]. *Iddirs* can be formed by groups of people in the village or by the whole community, "community *Iddirs*," in which other "group *Iddirs*" usually also exist (Dejene, 2003). *Iddirs* can cover different kinds of idiosyncratic shocks, most notably the death of a family member or a relative. The payout is intended to cover funeral expenses, which can represent a huge, unpredictable cost to poor households, and the amount is proportional to the degree of kindred between the insured and the deceased. The payout can be either cash, in-kind or labor. In the latter case, the community helps the member carry out the funeral ceremony (Dejene, 2003).

"Funeral risk" is by insurable due to low moral hazard, and, in spite of high mortality rates, covariance of deaths is low among members (Dercon *et al.*, 2006). Moreover, many *Iddirs* also insure members against other

[35] The ratio of collection (loan) to contribution.
[36] Aside from their functions as insurance and financial associations, *Iddirs* usually perform community tasks and can develop common business or social projects (Dejene, 2003).

kinds of shocks (illness, oxen death, etc.) and grant contingent loans from the *Iddir* funds (Dejene, 2003)[37].

Similar to the *Iqqubs*, the *Iddirs* have clear rules and regulations that guarantee a more stable structure and more resilience to deviations by members than more informal risk-sharing networks of friends and relatives. Yet different from the savings and credit associations, new members often have to pay an entrance fee to compensate the other members for assuming the increased risk and to avoid the dilution of accumulated funds (Dercon *et al.*, 2006). According to the data from the Ethiopian Rural Household Survey, the average contribution to the *Iddir* is ETB 55 per member, and the average payout is ETB 46 per member (Dejene, 2003).

Dercon *et al.* (2006) find that the likelihood of membership in rural *Iddirs* increases with the age of the household head and the household size. The authors also found that contributions to the *Iddir* increase with wealth and with the household size, suggesting that as long as the family enlarges, and given the high probability of death, the households are more prone to insure through *Iddir* against "funeral risk."

Hoddinott, Dercon and Krishnan (2005) find that wealthier households in the village are 3 percent more likely to be part of an *Iddir*. Similarly, Viganò *et al.*(2007) find that the participation in an *Iddir* among very poor households is 71 percent, compared to the 85 percent for the rich and 95 percent for the very rich. Hoddinott, Dercon and Krishnan (2005) also discover that larger households are more likely to join an *Iddir* since they

[37] Oxen-*Iddirs* are gaining importance in rural areas (Dejene, 2003).

have wider and more established networks in the village; households where the father or the family head has been member of an *Iddir* are also more likely to join one.

Similar to *Iqqubs*, the main advantage of *Iddirs* is their flexibility. However, Dejene (2003) suggests possible challenges and limitations: "segmented and personalized insurance market; problems of embezzlement of funds, which are exacerbated by law enforcement problems; funeral ceremonies and mourning entailing excessive expenditure of resources including time; limited financial capacity […] and restricted coverage of risks; heterogeneous composition of membership (in community *Iddirs*) creating problems of targeting interventions; lack of an umbrella organization and promotional institutions." (Viganò *et al.*, p. 125).

There are two types of *Iddir* (Bold and Dercon, 2009). One *Iddir* contract requires contributions to be made when the adverse event occurs and payments (or mutual aid) are made directly to the member, while the other *Iddir* contract requires members to contribute periodically to a fund and affected members are indemnified by the fund. The savings-based *Iddir* seems to provide a higher payout than the contingent-contributions based *Iddir* (Bold and Dercon, 2009).

Whereas *Iddirs* and *Iqqubs* can be regarded as indigenous financial institutions with a complex organizational structure, risk sharing networks of friends and relatives are informal institutions whereby transfers are made on the basis of shared values, trust and expected reciprocity in case of need. The main difference from the other two more structured arrangements stems from the type of contract and the level of enforceability of the contract. While the insurance parties, *Iddirs*, and the

credit and savings institutions, *Iqqubs*, are generally built on *ex-ante* payments or pre-existing agreements among several members, informal risk sharing networks rely more on contingent transfers and bilateral relationships. Therefore, while for *Iddirs* and *Iqqubs* the commitment of the members in making payouts is nearly fully guaranteed by the established mechanisms and regulations of these arrangements, informal risk sharing networks are characterized by a limited commitment based on dynamic incentives at the time of the payout (Coate and Ravellion, 1993).

If social constraints and values are not sufficiently stringent, the limited commitment, and, hence, the current and expected incomes of both participants in the risk sharing arrangement, determine whether the transfer is carried out. Santos and Barrett (2006) find that among the *Borana* pastoralists of southern Ethiopia, persistently poor people are excluded from informal risk sharing networks, leaving them vulnerable and without access to informal safety nets in times of need. This exclusion mechanism is fully explained by giver's expected gains and receiver's the ability to reciprocate. The wealthy households in the community value the transfer (usually of livestock) less and the poor households are less likely to reciprocate (Santos and Barrett, 2006). This result is also verified in terms of another measure of wealth, land ownership. According to Dercon and Barrett (2000), Ethiopian farmers with small land holdings are less likely to insure themselves or insure within the village. This wealth effect seems also to lead to inefficiencies in intra-household risk sharing, that is, the allocation of consumption among household members. Dercon and Krishnan (2000a) discover that, in southern Ethiopia, women suffer larger fluctuations in consumption than men and this sex bias seems to be highly correlated with wealth levels, i.e. women have a lower and more unsteady income than men.

Finally, rural financial markets in Ethiopia consist of different financial intermediaries and arrangements, with diverse levels of formality, organization and contractual structure. While MFIs and some RUSACCOs offer more formal financial services, *Iqqubs*, *Iddirs* and risk sharing networks provide informal financial services.

4. Risks and risk management strategies in rural areas of Ethiopia

In order to understand why risk sharing transfers (informal loans in this study) are made and what challenges are faced by formal intermediaries, it is worth analyzing risks and risk management strategies in rural Ethiopia.

Viganò *et al.* (2007) suggest that risks of farming in Ethiopia can be sorted into two major categories: yield risk and price risk. While yield risk regards the quality and quantity of crops and livestock produced by the farm, price risk regards the uncertainty of obtaining enough revenue for covering costs and having some profits[38]. Both risks are interconnected. Risks can also be classified into systemic risks (such as floods and drought) and idiosyncratic risks (such as death or illness of the breadwinner).

Poor households in rural Ethiopia are severely affected by several negative shocks. Dercon (2004) discovers that, in Ethiopia, harsh rainfall shocks persist for many years and substantially hinder the consumption growth of poor households. For example, indicators used to determine the

[38] Price risk entails both input and out prices.

severity of famine in 1984/85 are significant in explaining consumption growth in the 1990s. Dercon (2004) also finds that, in the Ethiopian areas considered, a 10 percent decrease in rainfall levels reduces food consumption by 5 percent, somewhat through price effects, and a 10 percent lagged reduction in rainfall makes consumption shrink by 1.6 percent.

Similarly, Dercon and Krishnan (2000b) suggest that rural Ethiopian households are limited in their ability to cope with both idiosyncratic and systemic risks. As a consequence, consumption is heavily dependent on rainfall performance, other shocks and time-contingent incentives, i.e. the opportunity cost of consuming in different periods. One of the main reasons why consumption strictly follows income shocks is due to incompleteness of financial markets. Even in a village economy where the savings market is efficient, income shocks can lead to drastic reductions in consumption (Deaton, 1991).

Many crop-related risks are to some extent systemic, even though some farmers are affected more than others, but there are some risks that are mainly idiosyncratic such as illness and death of family members.

Death of livestock is an important idiosyncratic shock. A pair of oxen provide the traction for ploughing in rural Ethiopia, and the illness or death of one or more oxen can markedly compromise agricultural production. Other livestock, such as donkeys and horses, are employed for transportation of goods from the village to the local market. Livestock represent an investment, and most farmers use savings to buy animals--especially if safer and more remunerative alternative saving opportunities are absent. Livestock is sold in times of hardship (Fafchamps, Udry and

Czukas, 1998) but, especially in Ethiopia, farm households seem to divest themselves of other animals before disposing of oxen (Mongues, 2006). This latter strategy is but another poor strategy, especially if the sale occurs during the period of occurrence of systemic shocks, whereby the price of livestock dramatically decreases as a consequence of a flooded market combined with low demand.

Another source of risk in rural Ethiopia is price fluctuations. Except for some cases, as discussed in Viganò *et al.* (2007) with reference to coffee farmers, poor farmers can neither diversify their price risk in international financial markets nor in wider local financial markets.

Regardless of strategies such as the access to informal financial arrangements, the establishment of sharing arrangements (oxen sharing or labor sharing), the accumulation of livestock or the diversification of production activities (engaging in some trade or off farm activities are examples), rural households in Ethiopia therefore remain exposed to many risks. The inability to efficiently insure risks leads farmers to avoid risky economic opportunities, even where these opportunities are expected to be more profitable. Moreover, when the negative event occurs, the latter might further compromise the accumulation of human, social and physical capital and, therefore, the ability of farmers to take on new opportunities. Besides, if a nutrition-productivity link exists, the inability to smooth consumption today will hinder productivity tomorrow.

Finally, given the intensity and frequency of negative shocks, the effectiveness of local risk sharing mechanisms are limited and disappear in the presence of systemic events. The expansion of formal financial

services into rural areas is hampered by the inability of managing such catastrophic risks.

5. The data and the collection methodology

A survey was conducted in one rural village, or *kebelé*, Abala Faracho, of the administrative zone (*woreda*) Humbo (430 km from Addis Ababa), that belongs to the Southern Nations, Nationalities and People's Region (SNNPR). The village is located about 1 km from the main road and 15 km from *woreda* Humbo. In the village there are approximately 4,450 habitants and agriculture, mainly subsistence agriculture, accounts for 90 percent of the local economic activity[39]. There are almost no irrigation infrastructures in the village and, as such, crop production is, for the most part, rain fed. Most of the population lives in huts made of mud and straw, called *tucul*, and few houses have roofing sheets[40].

In April 2010, over a period of two weeks, a sample of 349 households was selected and the respective household heads were interviewed. The dataset is cross sectional and includes data on the structure of the household, social characteristics and participation, production technology and strategies, negative shocks, and past and present personal finance decisions. In addition, selected leaders of *Iqqubs* and *Iddirs* were interviewed in order to understand the organization and regulation of these institutions in the surveyed area. The local representative and village agent of one of the two MFIs that operate in the area was also interviewed.

[39] Data and information provided by a local NGO.
[40]Data and information provided by a local NGO.

The objective, in this case, was to learn about the lending policies of the intermediary.

6. Dichotomy and segmentation of the rural financial markets in the surveyed area

In the following analysis, only lending services are considered. The focus on this side of the financial sector is due to two motivations. Data on savings is limited and unreliable. Also, except for *Iqqubs*, the other informal institutions that serve most of the population, *Iddirs* and risk sharing networks, do not offer explicit savings services.

Again, concerning the definition of the informal market, the analysis refers only to zero interest loans, and the expressions "informal loans" or "risk sharing transfers" are used interchangeably wherever the discussion regards such loans. This study considers only zero interest loans for two reasons. First, this study is meant to analyze, among other factors, the social features of informal loans where reciprocity is a peculiar characteristic. Second, in the sample, zero interest loans make up more than 80 percent of informal credit transactions, and excluding the other credit transactions from the analysis does not seem to produce misleading results.

In the area surveyed, one governmental MFI and one private MFI operate. Both intermediaries provide rural credit services through a group lending approach. The private intermediary provides only loans--also through a village banking approach if the number of borrowers in the group exceeds

a certain threshold. Lending groups self-select but each member receives a personal loan.

Aside from microfinance intermediaries, other more informal local intermediaries provide financial services to poor farmers in the area surveyed. Nearly 19 percent of the households surveyed are members of at least of one *Iqqub*. This result is close to that reported by Dejene (1993a). *Iqqub* funds were used for both investment and consumption. Almost all households belong to one or more *Iddirs*. Therefore, it can be assumed that households in the same risk sharing network belong to the same *Iddir*.

The data does not record the number of *Iddirs* that each household belongs to, but according to other studies (Bold and Dercon, 2009), many households are members of more than one *Iddir*; this was confirmed by interviews with local authorities[41]. Moreover, there is no evidence of the first type of *Iddir*, which involves contingent contributions, since all interviewed members of *Iddir* reported making periodic contributions to the fund. According to the survey, 97 percent of households participate in *Iddirs*.

The local rural financial market seems to be segmented along a loan destination line that, at the same time, corresponds to different loan terms and conditions. MFIs' loans are granted mainly for productive activities (livestock purchase or fattening, trade, etc.), while informal loans are granted mainly for consumption purposes (food, education and clothing), reflecting the different institutional mission of the two types of financial intermediaries. A simple analysis of loan characteristics reveals that this

[41] It's worth noting that one *Iddir* leader interviewed declared that the party was set up in 1970s.

separation of roles is somewhat clear-cut. The average amount lent in the formal sector is about ETB 2513 (€ 142.24)[42] while the average amount lent in the informal is roughly ETB 489 (€ 27.68), with standard deviations of ETB 1207.2 (€ 68.31) and ETB 737.22 (€ 41.71), respectively. Similarly, the maturity in the formal market is 374 days on average whereas in the informal market it is 108 days. The F-test and t-test for variances and means suggest that the two samples can be considered statistically different. The variance of size of informal loans in particular is relatively higher, confirming that Ethiopian farmers apply to the informal sector for contingent necessities, and that this market is thus more flexible. Therefore, the two markets are likely to be complements, at least in the surveyed area.

Figure 1 and Figure 2 further confirm this dichotomy. The local formal credit market is specialized in the provision of larger amounts at longer maturities. On the contrary, the local informal credit market is specialized in the provision of smaller amounts at shorter maturities, even though it is able, in some cases, to also provide loans of comparable size to those offered formally.

Data on access to each market shows that only 8.3 percent of the full sample and 14.8 percent of those who have used credit services over the previous year applied to both markets, while 14.3 percent and 33.5 percent of the sample has used either formal or informal credit services exclusively.

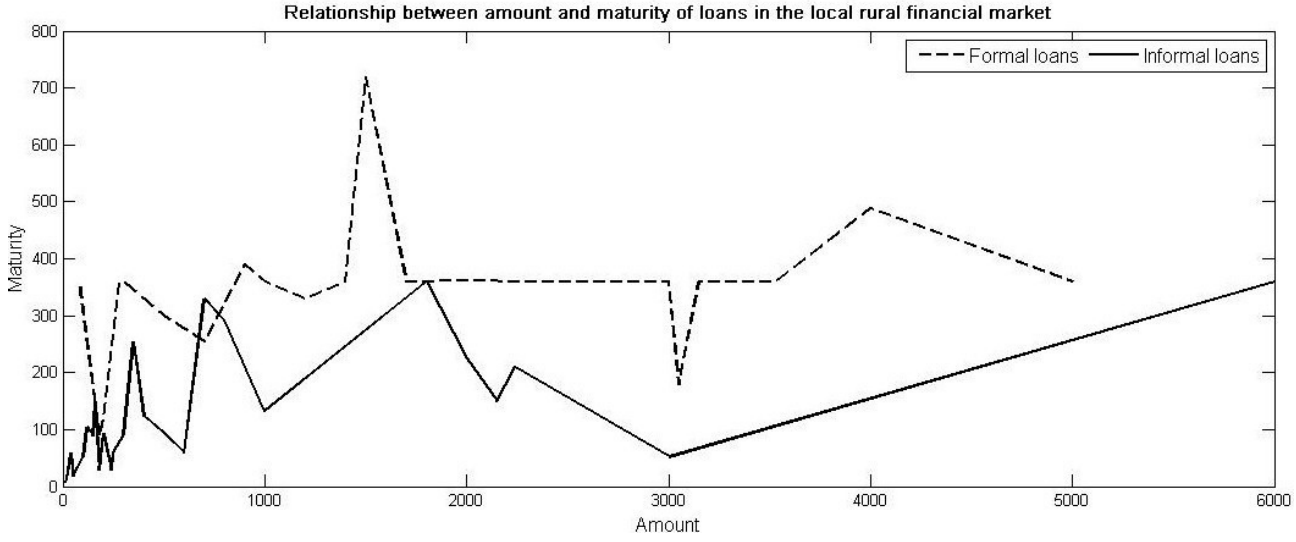
[42] 1 Ethiopian Birr (ETB) is almost equal to € 0.0566 (www.150currency.com, 16th July 2010).

Table 1 – Comparative analysis of amounts and maturities in the formal and informal sectors.

	Formal	**Informal**
Average Amount (ETB) [a]	2512.91	488.97
St. Dev. Amount (ETB)	1207.2	737.22
t-value Amount	2.08	0.66
Average Maturity (days) [b]	374.05	107.78
St. Dev. Maturity (days)	196.71	133.98
t-value Maturity	1.9	0.8
Median Amount (ETB)	2700	250
Median Maturity (days)	360	30
F-test on variance Am.	***2.68	-
t-test on mean Am.	***13.52	-
F-test on variance Mat.	***2.16	-
t-test on mean Mat.	***10.68	-

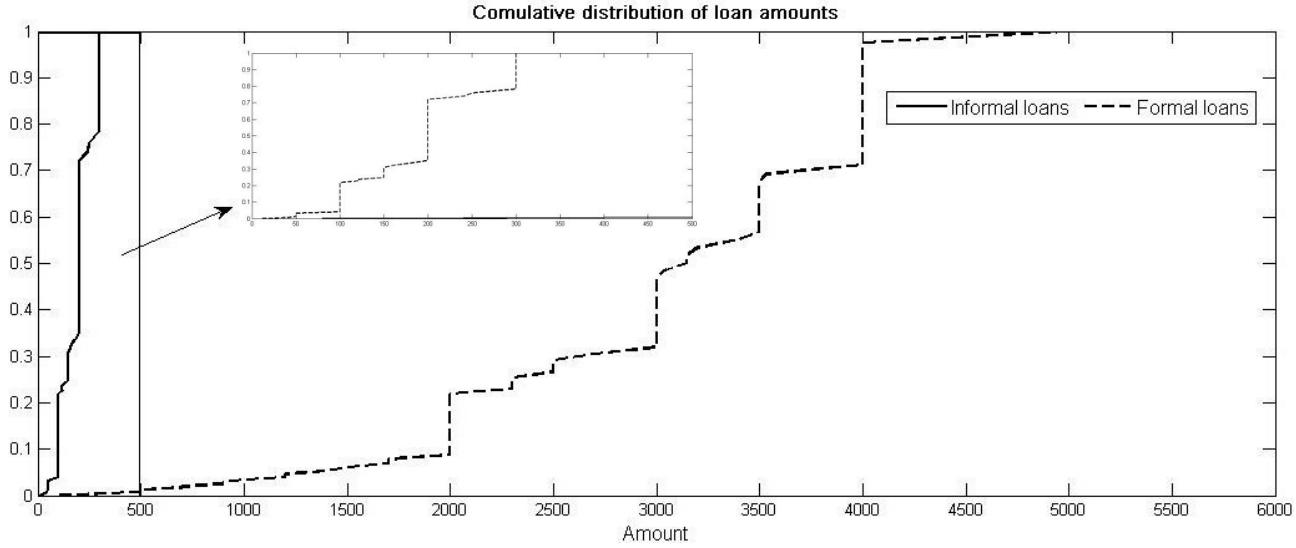
Source: survey data
***1% significance level
[a]Amount in ETB
[b] Maturity in days

Figure 1 – Relationship between amount and maturity of loans in the local rural financial market.



Source: survey data

Figure 2 – Cumulative distribution of loan amounts

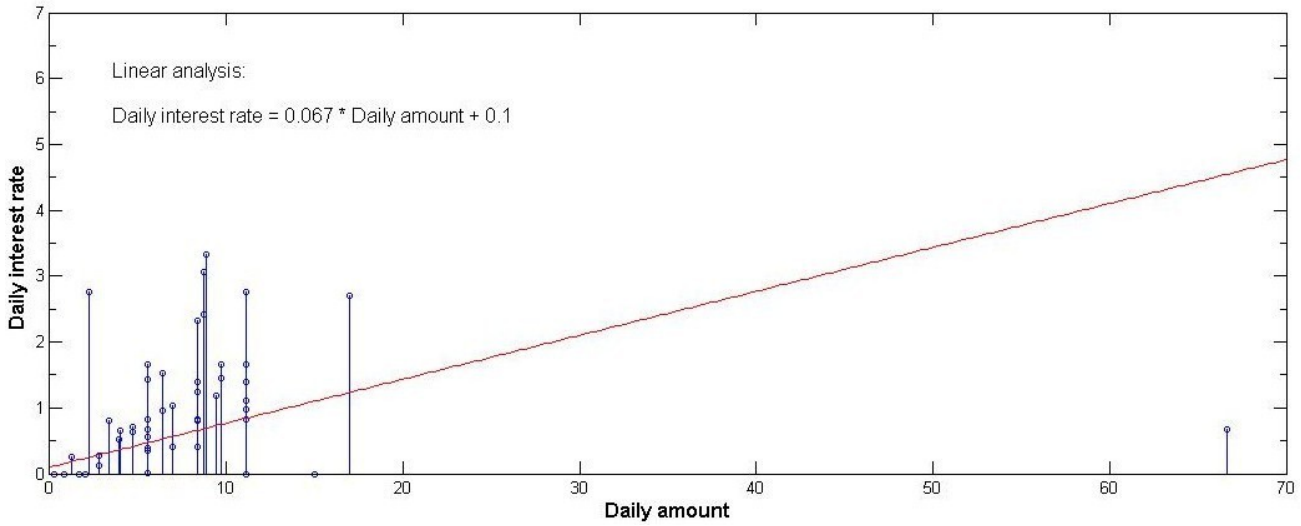


Source: survey data

Another analysis that aims at supporting the preliminary results is carried out considering the daily amount and daily interest rate. Figure 3 depicts the relationship between the daily amount borrowed in the microcredit market and the daily interest charged. In the local formal microcredit market there seems to be a positive relationship between the daily amount borrowed and the daily interest. As the daily amount increases by one ETB, the daily interest charged by the microfinance sector rises by 0.07 percent. Even if this might be detrimental to competition with the informal market, formal lending institutions are able to compete as the possible benefits in terms of longer maturity of the loan may overcome the cost of borrowing. From Figure 4, it can be inferred that the local formal microcredit market is characterized by a lower daily loan size (ETB 1.78 compared to ETB 3.61 for the informal zero interest credit market) and a lower variance in both absolute and relative values. The formal market also offers loans with longer maturities. A one ETB increase in the total loan amount increases the maturity of a formal loan by 0.12 days

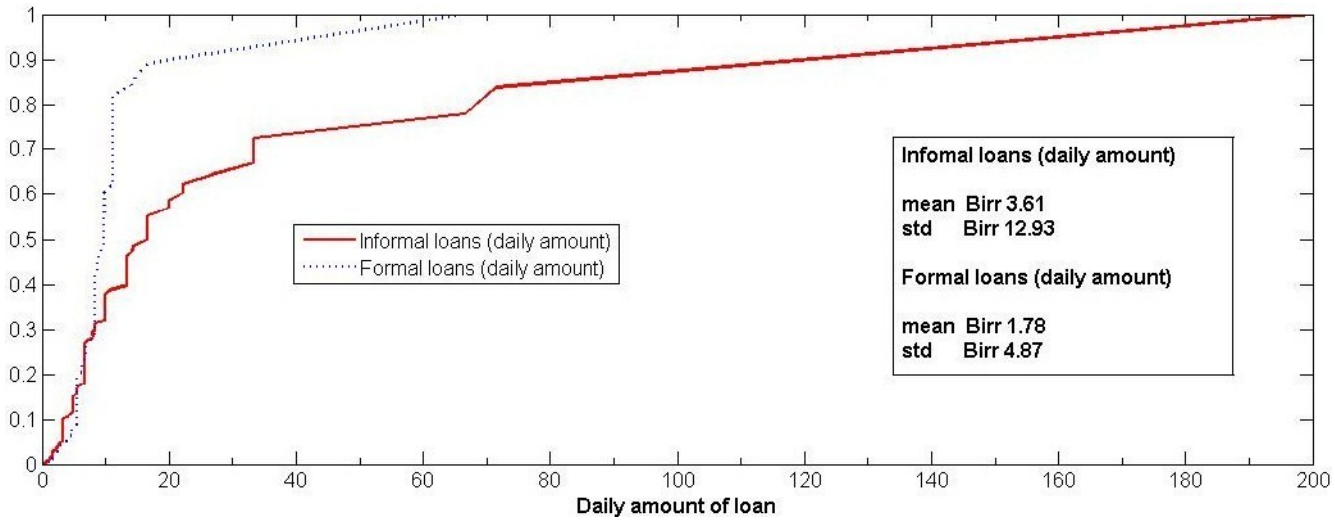
compared to 0.09 days for the informal market, as reported in Figure 5 and Figure 6, respectively.

Figure 3 – Relationship between daily amount (in Birr) and daily interest rate in the local microcredit market (n = 336).



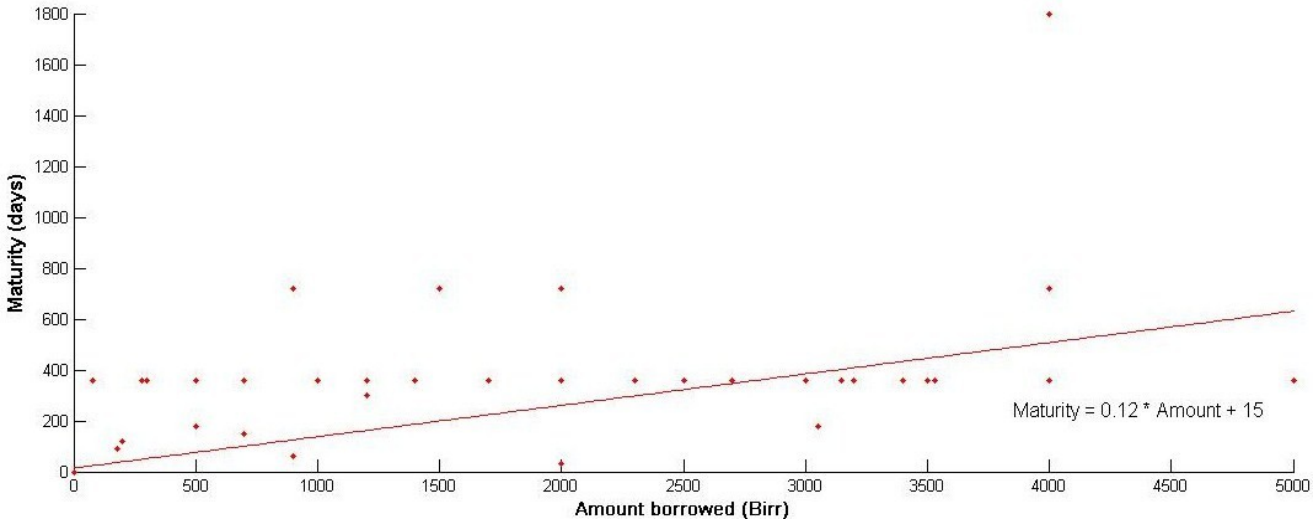
Source: survey data

Figure 4 – Cumulative distributions of daily amount (in ETB) of formal and informal zero interest loans respectively (n = 336 and n = 341).



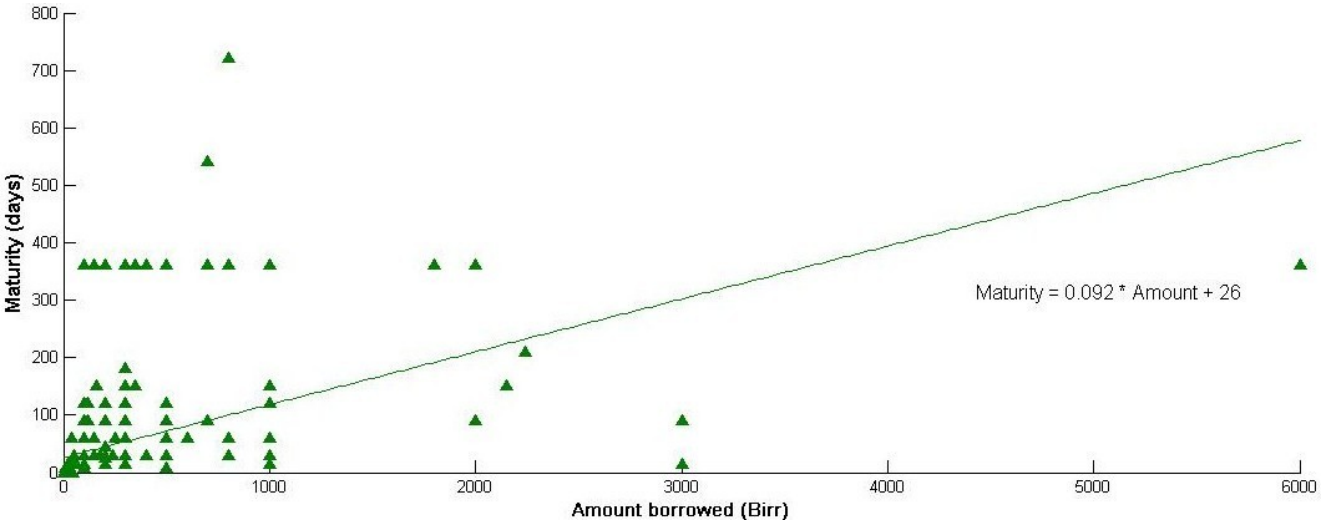
Source: survey data

Figure 5 – Relationship between maturity and amount borrowed (in ETB) in the local microcredit sector.



Source: survey data

Figure 6 – Relationship between maturity and amount borrowed in the local informal zero-interest credit market.



Source: survey data

Finally, one can conclude, similar to Zeller (1994) for Madagascar, that market segmentation in rural Ethiopia is mainly related to the exclusive characteristics of the different credit, savings and insurance products, implying that formal and informal services are not perfect substitutes. Since most rural formal financial services are provided through group lending, similar social mechanisms and forces might be present in both markets and might compensate for one another, that is, there might not be any specific informational advantage in the informal sector. It follows that other factors can play a more significant role. Loan destination, interest rate, maturity, transaction costs and wealth effects can be discriminating factors in the use of rural financial services in Ethiopia. For instance, the fact that the formal sector does not provide emergency, consumption or contingent loans while the informal sector provides short term and short notice loans leads to a clear segmentation of the local market. It is similar to say that the formal market focuses on loans with productive purposes whereas the informal market focuses on loans to manage unexpected shocks[43].

7. Risks and risk management strategies: evidence from the survey

The data collection on idiosyncratic and systemic shocks was partially conducted following the methodology in Viganò *et al.* (2007). Some adaptations were made to allow for the peculiarities of the social and economic systems in the surveyed village.

[43] The ability to face unexpected consumption needs, such as education or food, can also lead to increased productivity through the consumption-productivity link discussed above. Education is an investment in human capital.

In the village, the main source of risk appears to be rainfall, as its farming systems are entirely rain fed. Both low and high levels of rainfall lead to possible crop failures. On the one hand, the interaction between drought and poor irrigation systems seriously compromises land productivity. On the other hand, heavy rains or long periods of rain can damage crops or delay planting, increasing the probability of crop failure. Both of these types of risk are present in the area considered here. The percentage of households surveyed that said they had been affected by drought or "too much rain" are 98 percent and 73 percent, respectively. These results differ from Viganò *et al.* (2007), where only half of the households reported being thus affected. Differences in the survey year and location of the villages considered explains the disparity[44].

Similar to rainfall shocks, the lack of access to improved seeds or pesticides may also contribute to a drastic reduction in yields. 61 percent of surveyed farmers reported having been badly affected by pests and crop diseases, and 49 percent stated that unsuitable technology had in some instances led to radical crop failures.

Roughly 70 percent of households reported having been hit by high input prices. This percentage is nearly three times that reporting large drops in crop and tree products prices. In the area surveyed, the farmers' produce is sold in local markets. In contrast, inputs are imported from other areas by local retailers and therefore are more susceptible to external changes in prices.

[44] In Ethiopia, altitude and levels of rain heavily change from area to area.

According to the survey, 33 percent of households have suffered from idiosyncratic shocks such as illness of a family member and inability to work due to illness of the household head. Nonetheless, illness is not the only highly pervasive idiosyncratic risk. 13 percent of households surveyed experienced the death of a family member, and 2.5 percent underwent the death of the family head. As was the case for rainfall shocks, there is a clear disparity between the results found here and in Viganò *et al.* (2007), in which authors report that 37 percent of households suffered from illness of the family head and 19 percent were hit by the death of the family head.

Table 2 – Percentage of households surveyed (n = 349) that have been affected by any of the following shocks over the last 5 years, and faced a serious loss of important assets or a dramatic reduction in the family's consumption. Results are compared with those found in Viganò *et al.* (2007).

Shocks	% **Survey**	% **Viganò *et al.* (2007)**
Drought	98	50
Too much rain or flood	73	34
Land slide	25	18
Frost or hailstorm	33	22
Plants pests and diseases	61	59
Destruction of plants by vermin or animals	33	59
Dangerous weeds	55	7
Large increase in input prices	70	63
Large drops in cash tree products prices	21	-
Large drop in cash crop prices	28	-

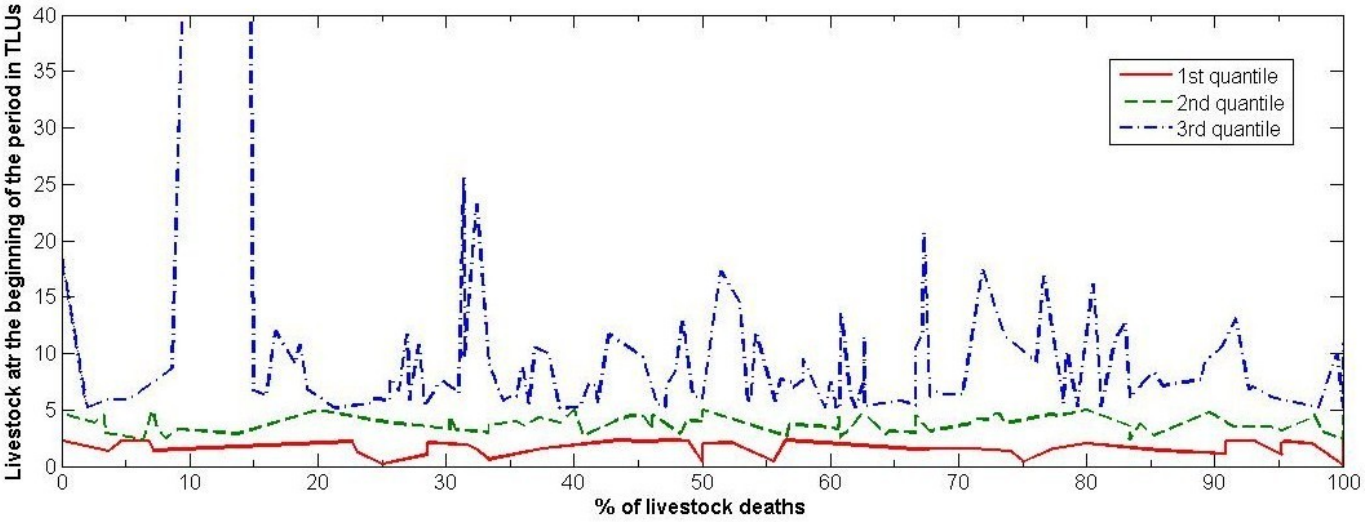
Large drop of other product prices	11	-
Loss of farmland	17	52
Theft of property	9	20
Burning of property (or arson)	6	6
Breakdown of the household (e.g. divorce)	5	7
Litigation of counterproductive disputes	11	-
Crop failures due to the use of unsuitable technology (e.g. poor quality improved seeds)	49	9

Source: survey data

Another common idiosyncratic shock is livestock death. In Figure 7, the percentages of livestock deaths are split according to wealth, measured in terms of quantity of livestock held at the beginning of the year. As can be observed, in all the terciles the percentage of livestock losses remains remarkable. The means of livestock deaths are 37 percent for the poorest tercile (first), 48 percent for the average tercile (second) and 52 percent for the better-off tercile (third), i.e., moving from the poorest to the richest tercile, the increase in the percentage of livestock deaths is statistically significant (Figure 8). This unexpected result is easily explained in terms of livestock ownership. 48 percent of the farmers in the poorest tercile did not own livestock in the year prior to the survey. This suggests that the poorest farmers choose not to invest in any livestock because the probability of death is very high. In other words, livestock death risk dramatically hinders the purchase and accumulation of livestock, especially when this risk is higher than the probability of breeding. Another possible interpretation of this seemingly contrary result is that multiple accumulation thresholds exist.

In light of these highly pervasive risks, poor farmers have few and ineffective risk management strategies. 33 percent of the households surveyed declared not to have any strategies for coping with an expected crop failure. This result suggests some evidence of inertia in anticipation of shocks. 34 percent would change type of crop and 27 percent would plant more drought resilient trees, for example *halaqua*, a low quality and low nutritive plant. Some households--31 percent of those surveyed--would sell some livestock in case of crop failure.

Figure 7 – Relationship between the livestock owned by the household, in tropical livestock units (TLUs), and the percentage of livestock deaths over the last 12 months.



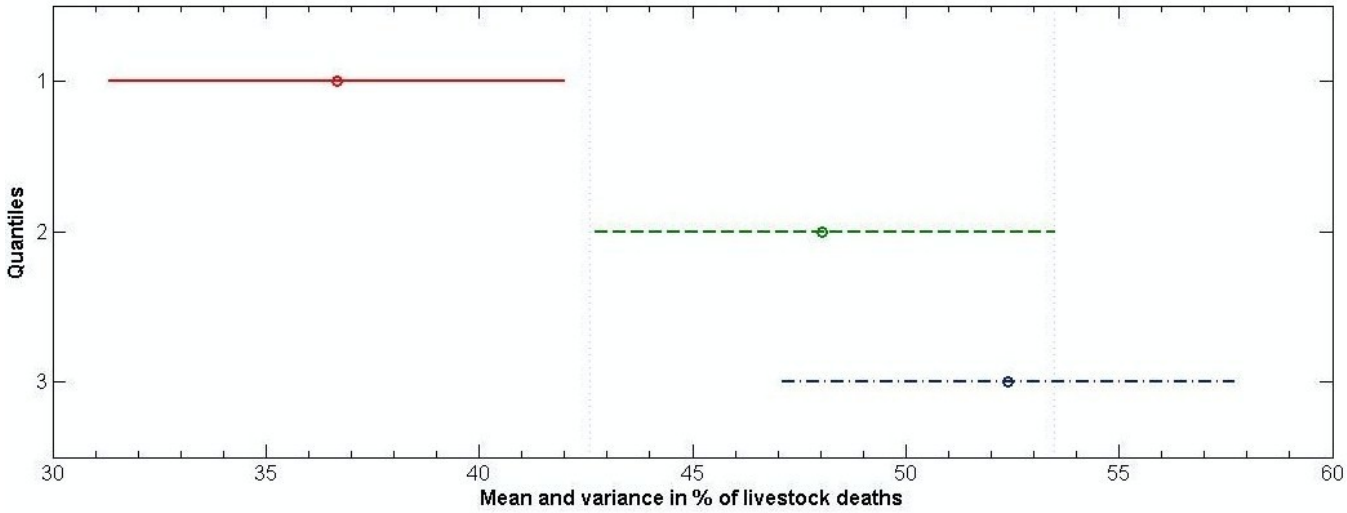
Source: survey data

Other strategies are also employed: 29 percent of household heads said they would join a local informal financial network, 30 percent would participate in a production cooperative and 33 percent would carry out some non-farming activities (such as guard, carpentry or trade activities). Finally, expectations of receiving aid from government and international

NGOs are also high, and aid is considered as a management strategy by 27 percent of the households.

Overall, the survey confirms that rural Ethiopian households seem to be exposed to several serious risks, and no fully efficient strategies in managing such risks are available.

Figure 8 – Analysis of variance of death percentage among terciles of livestock



Source: survey data

Table 3 - Stated risk management strategies in case of expected reduction in rainfalls level the next year.

Risk strategies	%
Change type of crop	34
Plant different trees	27
Sell some livestock	31
Sell some other assets (radio, jewellery, etc.)	2

Become member of *Iqqub/Iddir*	29
Participate in the production cooperative	30
To do non-farming activities	33
Expect help from government/NGOs	27
No strategies	33

Source: survey data

8. The theoretical model of interaction between formal credit and risk sharing transfers

The objective of the study is to investigate the interaction between the rural formal microfinance market and informal risk sharing networks. In order to formally develop such a research question, a simple dynamic model is introduced to provide a theoretical starting point.

Consider a dynamic, discrete-time infinite horizon game whereby two interacting agents can either opt in or opt out of a risk-sharing arrangement. The risk sharing contract is such that agents decide *a priori*, that is, before any another decisions are made, the share of their pooled income that they want to assign to each other. After the share is set, agents start interacting. At every interaction, the two agents also have to decide whether and how much to borrow from an external intermediary. The decision variables available to the agents are, therefore, both continuous and discrete. In particular, the continuous decision variable is how much to borrow and the discrete decision variable is the decision to either remain in the risk-sharing mechanism or fall permanently into autarky.

In this simple game, the income realizations and wealth levels are observable and verifiable. In addition, agents are infinitely lived and risk averse.

It is also assumed that agents are price-takers and that they cannot influence the interest rate, which is set exogenously by the financial intermediary.

As discussed above, in contrast to standard models of risk-sharing with limited commitment, here the risk sharing rules are agreed upon at the beginning of the arrangement. The allocation might be more or less "fair" depending on the share, θ, of pooled incomes. This risk-sharing model is a non-cooperative game and, therefore, the outcome is a Nash equilibrium. It follows from the Bellman's Principle of Optimality that the second-best solutions of the risk-sharing game are the solutions of two simultaneous systems of exclusive equations:

$$V_i(s_i, s_j; y_i, y_j)$$
$$= \begin{cases} \max\limits_{-B \le x_i \le 0} \begin{Bmatrix} u(w_{ij} + x_i) + \delta E_{y_i', y_j'} V(g_i(x_i), g_j(x_j); y_i', y_j'); \\ V^a(s_i, y_i) - P(nd) \end{Bmatrix}, if\ d_i = 1 \\ V^a(s_i, y_i), \qquad if\ d_i = 0 \end{cases}$$

where y is the income realization, x is the amount borrowed, B is the maximum borrowable amount, s is the amount to be repaid to the intermediary and is equal to the value generated by the repayment function, $g(x)$, w is the wealth at the beginning of the period and is determined by $y - s - \theta(y_j - y_i)$ and, finally, $V^a(s, y) = u(s + y + x) +$

$\delta E_{y'} V(g(x), y')$ is the expected utility obtained by an agent who lives in autarky.

P(nd) is the social punishment function. It can be regarded as the utility loss derived from being excluded from non-economic social activities, or, more generally, the informal penalty for not abiding by the risk sharing contract. P is a function of the number, n, of interactions between the two agents.

If it is assumed that the cost of lending decreases as the amount lent increases, i.e., there exist economies of scale for the lender, then a possible functional form is as follows:

$$g(x) = x\big(1 + r(x)\big)$$

where $r(x)$ is a function such that $\frac{\partial r(x)}{\partial x} \geq 0$ and $\frac{\partial r(x)}{\partial x^2} \geq 0, \forall x \in [-B, 0]. d_i$ is an indicator function that takes value 1 if $u(w + x) + \delta E_{y_i', y_j'} V\big(g_i(x_i), g_j(x_j); y_i', y_j'\big) \geq V^a(s, y) - P(nd)$ --utility derived from risk sharing is higher than utility in autarky after deducting the punishment value in terms of utility loss-- and, otherwise, takes value 0.

The model is not solved here, as its detailed discussion is not object of this study. However, a discussion of a similar model can be found in Castellani (2010)[45]. The author finds that an increase in the borrowable amount for

[45] It can be demonstrated that, in absence of risk sharing opportunities, the F.O.Cs establish that the marginal utility of each agent must be the same in every period. Otherwise, if risk sharing opportunities exist, another condition must apply, that is, in

the agent who applies to the formal sector increases the utilities of both agents in the risk sharing networks, but that the amounts transferred between agents diminish. An opposite effect is observed as the interest rate increases, and both agents' utilities diminish. The limited commitment constraint implies, however, that each agent must contrast the level of utility reached in risk sharing with the possible level of utility reached in autarky. If the latter is higher than the former for at least one of the two agents, the risk sharing mechanism breaks down and both agents fall back to autarky.

The theoretical model suggests four possible outcomes from the interaction of the two markets:

1) neither agent borrows or engages in risk sharing;
2) only risk sharing exists;
3) only borrowing exists;
4) both borrowing and risk sharing exist.

The factors that explain these four possible alternatives are studied in the applied analysis.

9. The econometric approach and the explanatory variables

In order to study the factors that explain the four possible outcomes deriving from the interaction of the risk sharing mechanism and the borrowing from formal intermediaries, a Generalized Multilogit Model is estimated. The estimated coefficient of each variable is the conditional marginal probability of making a given choice with respect to the

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every period, the marginal utility of each farmer with respect to the quantity borrowed must be equal to the marginal utility of the other agent.

alternative, e.g., participating in the risk sharing arrangement only instead of both borrowing and risk sharing.

For the multinomial logistic model, the linear component is equated to the log of the ratio between the odds of the *jth* alternative and the odds of the baseline alternative, *j**:

$$log\left(\frac{\pi_{ij}}{\pi_{ij*}}\right) = X_i^{'}\beta_j$$

The probability that individual *i* chooses alternative *j* is:

$$\pi_{ij} = \frac{e^{X_i^{'}\beta_j}}{1 + \sum_{k \neq j*} e^{X_i^{'}\beta_k}}$$

and, the probability for choosing the baseline category is

$$\pi_{ij*} = \frac{1}{1 + \sum_{k \neq j*} e^{X_i^{'}\beta_k}}$$

where X_i is the vector of explanatory variables for individual *i*, and β_k is the vector of the coefficients to be estimated for alternative *k*.

The dependent variable is discrete and can take one of four values: 1, no borrowing takes place; 2, both types of borrowing take place; 3, only informal borrowing (transfers in risk sharing) takes place; and, finally, 4, only formal borrowing takes place. The last alternative is considered the baseline alternative. As discussed above, formal borrowing is represented

by the decision to borrow from the MFI and informal borrowing is represented by the decision to accept zero interest rate loans from friends, relatives, neighbors, *Iddir* and *Iqqub* that are assumed to be a proxy for risk-sharing transfers.

The explanatory variables have been selected according to seven categories of factors that have been considered relevant for the analysis.

The first category stems from studies on risk sharing mechanisms in Ethiopia[46]. As for such studies, liquidity constraints and wealth are major factors that explain either the participation in or exclusion from risk sharing networks, where the poorest are usually excluded from such networks. The main source of income in rural Ethiopia is farming, and two rough measures of wealth are land holdings and livestock[47]. The latter has been split in quartiles and each farmer has been assigned to her quartile. As for land holdings, only membership in the richest quartile has been considered.

The second category includes social characteristics of the local financial markets, and participation in local cooperatives or oxen sharing and labour associations is a proxy for the existing social capital and social participation. The objective is to test if social interconnections play any role in the decision to participate in the formal sector relative to participation in the informal one, that is, if the social aspect of belonging to one market or the other is more relevant to the households' decision making process. As much as the household is socially harnessed with the

[46] These risk sharing mechanisms were discussed previously, in section 7.
[47] Landholding is measured in log of timad. A timad is a local measure that refers to the quantity of land that can be plowed in a day with a pair of oxen. The livestock is measured in tropical livestock units (TLUs).

other households in the community, the local norms and the possible social punishments can play an important role in the decision to quit the risk sharing network. The variable considered as a proxy for social cohesion is an index of the participation in other local institutions: oxen sharing, and membership in rotating work parties and production cooperatives[48]. In the rotating work parties (also referred to by the local name *wenfel*), farmers practice reciprocal labour on their fields to plant and harvest in more opportune periods, thus lowering the risk of crop failure. These parties often entail the establishment of oxen sharing arrangements whereby two or more farmers decide to combine resources and lend their oxen to each other.

The third category regards the risk aversion and preferences of households. More risk averse farmers are assumed to self exclude from one financial sector because they deem it to be more risky than the other. Similarly, consumption time preferences are assumed to influence households in their decision to participate in the informal market instead of the formal one, or *vice versa*. The number of household members and the gender of the household head have been employed as proxies. Also, the experience of households in terms of their farming capabilities and the amount of time they have lived in the same village might have some effect on their risk management choices. Older individuals might more highly value the risk sharing networks and can have more deeply rooted relationships with friends and neighbors. This effect has been proxied by the age of the household head.

[48] The index is a simple average of the number of institutions to which the household belongs, normalized with respect to 1.

Risk aversion can also be explained by the level of exposure to negative shocks and, at the same time, negative shocks can activate the risk sharing mechanism. Shocks can explain the decision to apply for help from or the decision to deny help to someone. In order to measure the exposure to shocks, several idiosyncratic (or low covariance) events have been considered: death of a family member, illness of a family member and death of animals (in TULs).

The fourth category accounts for the type of contract in the *Iddir* to which the household is member. As discussed above, *ex-ante* payments loosen the binding constraint of risk sharing and increase the probability of achieving full insurance. This might incentivize the household to apply for credit from an informal institution instead of from a microfinance intermediary. In this regard, the amount that each household contributes to the *Iddir* has been included in the analysis.

The fifth category takes into consideration the existence of external initiatives of the government or NGOs that can lead to possible biases in the decision of participating in one financial market compared to the other. According to Jayne *et al.* (2002), food aid in Ethiopia has historically taken two main forms: unconditional free distribution of food, which is also regarded as "emergency" or "relief" distribution, and food-for-work, which is more regarded as a "development" strategy. As for Clay and Stokke (2000), food aid can produce perverse incentives and have some effects on local food prices and labour allocation among different activities. Jayne *et al.* (2002) find that food aid in Ethiopia appears not to be allocated by income differences among households but by costs in establishing the scheme, and the process of identifying needs leads to a degree of inertia in the allocation of food aid. Finally, according to Sharp

(1997), local administrations (*kebelé*) are urged to use a set of selection criteria to determine which households are eligible but, however, they rely on ample discretion in the selection process[49].

In the analysis, it is supposed that food aid can produce disincentives to participate in risk sharing networks or to request a loan. If food aid has a wealth effect on the beneficiaries, it can make the participation constraint in local credit markets more binding. If informal insurance must be self-enforcing to be sustainable, any scheme that changes the value of autarky relative to that of participating in the scheme would affect the degree of risk-sharing (Lingon *et al.*, 2002; Attanasio and Rios-Rull, 2000). Dercon and Krishnan (2003) suggest that, in rural Ethiopia, food aid seems to crowd out local risk-sharing arrangements to some extent, even though food aid itself seems to be barely shared among villagers. With regards to the expected results, the effect of food aid is uncertain. On the one hand, provision of aid can undermine incentives to participate in the formal and informal markets, and therefore would not affect the trade-off between the two markets. On the other hand, if the availability of food aid unbalances the incentives to enter in one market relative to the other, it can influence the decision whether to participate in the risk sharing network compared or the microcredit. To control for possible food aid effects, the quantity of food aid received by each household has also been considered in the analysis.

Finally, the last category considers the direct cost of borrowing from the microfinance institutions, i.e., the interest rate. The interest rate also

[49] The interviews with the local administration revealed that this sort of administrative "meddling" is also enforced to some extent when a microfinance intermediary wants to start operating in the *kebelé* area.

proxies for the amount borrowed in the formal sector, as the two variables are highly correlated. The cost of borrowing has been employed to study the trade-off between the two types of financial services through cost and quantity effects.

In the analysis, it is assumed that all of these variables are exogenous to the decision of participating in both the formal and informal credit markets. One possible issue with this assumption is the timing of the realization of each variable with respect to the dependent variable, since the data are cross-sectional yet capture both past and present characteristics, shocks and strategies of households. For instance, according to the survey, it is not possible to ascertain whether the current number of livestock were constrained by the lower liquidity provided by loan. Nevertheless, in this case, most of the households declared to use the loan for consumption, health care or education purposes[50]. Only some loans were intended for buying livestock, fatten livestock, or invest in working capital. This should rule out some of the potential endogeneity problems.

Finally, the main drawback is that data are cross-sectional and therefore, this analysis entails all of the pitfalls of the use of one-time data and the limitations in drawing consistent conclusions.

10. Results and discussion

Before estimating the model, missing data values were reconstructed using a multiple imputation approach. Five different datasets were used

[50] This can be provided to the reader.

in the estimation and the different estimates and standard deviations were averaged out as suggested in Allison (2002).

The effects on the probabilities of the first three alternatives (no borrowing, borrowing in both markets and only informal borrowing) were estimated against the fourth alternative (only formal borrowing). The results of the estimation are in Table 4.

Two models were estimated. The interest rate variable was included in the second model, and excluded in the first model. This was done to examine possible side effects of the cost variable on other variables.

The results from the first estimation suggest the existence of three possible characteristics of the local rural financial markets. First of all, there seems to be a segmentation of access to financial sources according to the gender of the household head. Being male increases the probability of borrowing from the formal sector with respect to non borrowing or borrowing from the informal sector, and this effect appears to be stronger for the latter.

Second, belonging to the poorest quartile of livestock holdings significantly reduces the probability of borrowing from the formal sector compared to the other three alternatives, and in particular this effect is more marked for non borrowing while it lightly shrinks when considering the case of borrowing from both sectors and the case of only formal borrowing. This result suggests a wealth effect in the risk sharing mechanism, whereby more livestock-poor farmers are rationed in the informal market and through social screening of group lending. If this is the case, group lending with self selection of members does not reach the poorest households in the village. Another explanation is that the poorest

can also self exclude from borrowing as they would prefer insurance or savings products[51].

Finally, a third consideration regards possible distortions from food and food-for-work aid transfers. Aid, in fact, enhances the probability of borrowing from formal intermediaries with respect to non borrowing and borrowing from only informal sources. A similar effect is produced as family size increases, even though, in this case, only the effect with respect to informal borrowing is statistically significant. If food aid is distributed according to family size and the provision of microcredit services is biased with regards to family size, then these results would be partially explained. Thus, this supposition cannot be excluded. There is also the possibility that both food-aid transfers and microcredit services are simultaneously promoted by local governmental institutions. However, the food aid effect can otherwise be a crowding out effect of risk sharing mechanisms in the informal market while enhancing the risk sharing mechanism in the microfinance lending group. Households that have received aid are less likely to require contingent loans from the informal sector and would therefore apply only to the microfinance sector for larger and more long term loans.

The inclusion of the interest rate variable in the second model makes all the effects described above shrink and disappear. It turns out that the characteristics of the two financial products are the only factors that explain the decision to borrow from the formal market or the informal market. As the interest rate and the amount borrowed from the formal market increase, the probability of borrowing only from the microcredit

[51] One MFI has recently started a voluntary savings mobilization program.

market increases. First, this result suggests that if the amount borrowed is relatively great, households are afraid of contracting more debt in the informal sector. Second, a greater amount obtained in the formal market might mean looser liquidity constraints and, therefore, a reduced necessity to seek additional funds in the informal sector. Third, as the amount in the formal sector is greater than in the informal, households that haven't a sufficient repayment capacity are excluded from loan groups. This proposition is partly supported by the scheme through which the formal microloans are provided. MFIs in the community have adopted a group liability mechanism for granting loans to farmers. This mechanism entails a shared liability among all the members of the group whereby all members of the group are responsible for repaying the loans of any one defaulting member. This structure triggers social mechanisms of screening and monitoring. More indebted farmers might be rationed in the access to local sources. This compensation effect is confirmed by the insignificance of the social participation variable, even though the signs suggest that farmers that had access to both formal and informal financial services are not allowed to borrow in the formal one.

There is another explanation of why the cost of borrowing (or amount borrowed) in the formal market becomes the only relevant variable regards the interaction of the two markets. If the theoretical model of interaction described in Castellani (2010) is verified, as long as the borrowable amount augments (also, in this case, the cost of borrowing increases), the farmer prefers to apply to the formal lender and reduce the amounts transferred in the informal risk sharing arrangements. This can be done without violating any social constraint as long as the utility of the both agents increases (Castellani, 2010).

Table 4 – Estimation results of the Generalized Multilogit Regression Model. 5 multiple imputations for missing values. 4 alternatives: no borrowing (1), borrowing from both markets (2), only informal borrowing (3), only formal borrowing (4). (Number of observations = 349). The average likelihood ratio is 258.58.

		1		2	
Variables	**Alternatives**	**Estimates**	**St. Error**	**Estimates**	**St. Error**
Intercept	1	***1,6977**	1,0025	****8,4067**	3,3611
	2	-1,3297	1,6226	0,5183	2,0599
	3	*****2,9112**	1,0380	*****9,5182**	3,3702
Age	1	0,0229	0,0166	-0,0240	0,0352
	2	-0,0293	0,0264	-0,0393	0,0317
	3	0,0115	0,0177	-0,0354	0,0357
Sex	1	***-1,0836**	0,6529	-2,4442	2,5199
	2	0,6711	1,1953	0,4638	1,3016
	3	****-1,4363**	0,6552	-2,8082	2,5231
Number Family Members	1	-0,1043	0,0806	-0,1299	0,1660
	2	0,0452	0,1059	0,0504	0,1540
	3	****-0,1867**	0,0873	-0,2007	0,1707
4th quartile in land holdings	1	0,1890	0,4412	-1,0720	1,0157
	2	0,0187	0,6340	-0,0912	0,7863
	3	0,3525	0,4627	-0,9447	1,0323
1st quartile in livestock holdings	1	*****1,7603**	0,6428	0,7327	1,3602
	2	***1,4036**	0,8063	1,2956	0,8925
	3	***1,2679**	0,6581	0,2560	1,3738
2st quartile in livestock holdings	1	0,7270	0,5036	0,5750	1,3347
	2	0,3656	0,6865	0,2460	0,8142
	3	0,6127	0,5114	0,4607	1,3436
3st quartile in livestock holdings	1	0,6696	0,4448	-0,1381	1,0444
	2	0,0477	0,6379	0,0255	0,7180
	3	-0,1933	0,4818	-0,9893	1,0644
Death Family Member	1	-0,5680	0,5170	***-1,9344**	1,1011
	2	-0,5498	0,7530	-0,7910	0,8539
	3	-0,3098	0,5271	-1,6932	1,1091
Livestock deaths in TLUs	1	-0,0203	0,0698	0,2753	0,2234
	2	0,0378	0,0918	0,0622	0,1263
	3	0,0178	0,0721	0,3127	0,2246

Ill Family Member	1	0,3014	0,3949	-0,0313	0,8685
	2	0,4042	0,5263	0,4297	0,6253
	3	0,2746	0,4122	-0,0504	0,8812
Index Social Participation	1	-0,3697	0,5949	-0,1018	1,4183
	2	0,9455	0,8467	1,2056	0,8766
	3	-0,3958	0,6204	-0,1189	1,4350
Amount contribution to the *Iddir*	1	-0,0192	0,0403	-0,0505	0,0694
	2	-0,0073	0,0509	-0,0404	0,0745
	3	-0,0458	0,0504	-0,0640	0,0740
Aid Amount Received	1	**-0,0003	0,0002	0,0002	0,0003
	2	-0,0001	0,0002	-0,0001	0,0002
	3	*-0,0002	0,0002	0,0003	0,0003
Logarithm of formal interest rate	1	-	-	***-1,8769	0,3966
	2	-	-	*-0,2618	0,1481
	3	-	-	***-1,9899	0,4588

Level of significance: *10%, **5%, ***1%.
Source: survey data

11. Conclusion

Rural credit market in the surveyed Ethiopian village is segmented along quantity and maturity characteristics of the loan products. The MFIs offer microloans with larger quantities and longer maturities, whereas informal financial intermediaries and arrangements (*Iqqubs*, *Iddirs* and risk sharing networks) specialize in zero interest loans with smaller quantities and shorter maturities. This dichotomy explains the coexistence of both markets, i.e., why the formal sector does not crowd out the informal one. The results of the Multilogit regression analysis further support this position. As long as the size of loans offered by the microfinance sector is larger than that of the informal sector, farmers prefer to apply for a loan from the formal sector. The longer maturity of informal loans relative to MFI loans, however, is not detrimental but instead favors the proliferation

of risk sharing in the informal contingent loans. This is demonstrated by the large percentage of rural households that received an informal loan, and by the high rate of membership of rural households in informal financial institutions. This result suggests that creating more established links among formal and informal intermediaries can enhance the efficiency and outreach of both markets.

Notwithstanding microfinance and informal finance seem to be complements in the surveyed village, the group lending methodology of MFIs replicates the same excluding mechanism of the risk sharing arrangements. The poorest are rationed from borrowing from both markets. This result is similar to Zeller (1994) for Madagascar. The food aid distribution mechanism and gender segmentation also appear to be factors that further bias the provision of formal financial services.

A drawback of the study is however its reliance on a cross-sectional data set. A dynamic data set, i.e. panel data set, would permit a deeper analysis of the interaction between the two markets, controlling for possible causality problems and allowing to draw more robust conclusions on the social dynamics and the interaction process of the local financial markets.

The results of the study suggest the following policy implications. First, Ethiopian MFIs should make a deep assessment of the demand for financial services. The demand assessment is intended to ascertain whether the poorest are effectively excluded because of wealth effects or they self exclude because the financial products are not appropriate. It requires an analysis of the self selection process and in particular of the norms and social dynamics that take place in the selection of the group members. Offering both group and individual loans, and other financial

services, such as deposits or insurance can increase outreach to the most destitute[52].

Second, since formal and informal financial services are complementary, Ethiopian MFIs should establish structured links with local organized risk sharing arrangements, tapping their flexibility and enhancing the efficiency and outreach of both markets.

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